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REPORT
OF
HARBOR AND LAND
COMMISSIONERS

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Board of Harbor and Land Commissioners.

GEORGE E. SMITH, Chairman,
SAMUEL M. MANSFIELD,
HEMAN A. HARDING,

STATE HOUSE, BOSTON.

U.S. GOVERNMENT
PRINTING OFFICE
1909

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THIRTY-FIRST ANNUAL REPORT

OF THE

BOARD OF HARBOR AND LAND
COMMISSIONERS.

FOR THE YEAR 1909.



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THE STATE BOARD OF PUBLICATION.

The Commonwealth of Massachusetts.

REPORT.

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts.

The Board of Harbor and Land Commissioners, pursuant to the provisions of law, respectfully submits its annual report for the year 1909, covering a period of twelve months, from Nov. 30, 1908, being the thirty-first annual report of the Board since its establishment by chapter 263 of the Acts of 1879.

The present organization of the Board is as follows: George E. Smith of Swampscott, chairman, Samuel M. Mansfield of Boston, Heman A. Harding of Chatham.

From Dec. 1, 1908, to Nov. 30, 1909, the Board has given 191 formal and informal hearings, and has received 180 petitions for licenses to build and maintain structures and for privileges in tide waters, great ponds and Connecticut River, to dredge material, to remove material from beaches, and for other purposes.

Eighty-three licenses for structures and privileges in tide waters, great ponds and Connecticut River have been granted during the year; also 76 permits for dredging, for the removal of material from beaches, and for other purposes.

Inspections have been made at various times by and under the direction of the Board, of work completed and in progress; of sites of authorized work, under appropriations made by the Legislature; also upon petitions and plans presented of the sites of proposed work in tide waters; various structures built under licenses; sites of alleged dumping of material into tide waters; Connecticut River; great ponds; town boundary survey work.

Through transactions of the Board there has been paid into the treasury of the Commonwealth during the year from sales, rents, licenses, leases and other sources, and credited to the Commonwealth's flats improvement fund and the harbor compensation fund for Boston harbor, the aggregate sum of \$42,464.05. This does not include income.

During the year 16 contracts were made, involving the estimated expenditure of \$157,655.21. A list of these contracts and those pending, with details relating thereto, may be found in the Appendix.

BOSTON HARBOR.

The project of June 13, 1902, adopted by the federal government for the improvement of Boston harbor, is to provide channels 35 feet deep at mean low water, 1,200 feet wide from the Navy Yard at Charlestown and the Chelsea and Charles River bridges to President Roads, and 1,500 feet wide from President Roads through Broad Sound to the ocean.

The above project is the only one now under contract. The Board is informed by the engineer officer in charge that contracts for dredging authorized by act of Congress, dated June 13, 1902, are in force, embracing the dredging of 9,780,000 cubic yards, and on Dec. 1, 1909, 9,465,295 cubic yards had been dredged. A channel 540 feet in width from the Navy Yard and the bridges to President Roads, and approximately 600 feet wide thence to the sea, had been dredged, through which a general depth of 35 feet at mean low water existed; but the channels were obstructed by numerous small shoals yet to be removed to complete the contracts.

All ledges obstructing these channels had been removed.

Under the contract for dredging authorized by act of Congress dated March 2, 1907, and embracing the dredging of 12,210,000 cubic yards, to Dec. 1, 1909, 5,897,449 cubic yards had been dredged. The date of completion of this contract is Dec. 31, 1911, when it is expected a channel 35 feet deep at mean low water will have been obtained, 1,200 feet wide from the Navy Yard and the bridges to President Roads, and thence 1,500 feet wide to the sea.

On April 5, 1909, this Board entered into a contract with the

Eastern Dredging Company to dredge in Boston harbor opposite India wharf and the dock between said wharf and Rowe's wharf, over an area about 550 feet long and 300 feet wide, to the depth of 23 feet at mean low water. The contract price was 28 cents per cubic yard, measured in scows.

This work was finished May 4, 1909, the excavation being 16,953 cubic yards, and the total cost \$4,746.84, paid from the income of the harbor compensation fund.

The removal of this material has improved the facilities for navigation in this part of the harbor.

ANCHORAGE.

The anchorage basin in Boston inner harbor along the north-erly side of the main ship channel, covering an area about 1 mile in length and 1,000 feet in width, equivalent to about 126 acres, has been dredged to a depth of 30 feet at mean low water, under authority of chapter 476, Acts of 1901, the amount of material excavated being 3,081,853 cubic yards.

The work of dredging the additional area and building structures for the mooring of vessels, to complete the project as originally planned, has not been commenced.

A map showing the location of this anchorage basin was printed with the report of the Board for the year 1900.

Appropriations for this improvement have been made as follows: —

Chapter 97, Resolves of 1900,	\$2,500
Chapter 476, Acts of 1901,	1,000,000
	<hr/>
Total,	\$1,002,500

The amount expended during the year is \$49,672.20.

The total amount expended on this project to Dec. 1, 1909, is \$504,268.50.

CHARLES RIVER.

In January, 1909, a board of United States engineer officers gave a public hearing in relation to the Boston & Maine Railroad bridges across Charles River, it being proposed by the War Department to require that all of said bridges be rebuilt on

stone or iron piers; that the clear height of the draw spans be increased to not less than 23 feet above mean high water; that the width of the draw openings in all of said bridges be increased; and that said bridges be equipped with improved modern types of draws capable of quick operation.

There was much opposition expressed at this hearing from business organizations and individuals, particularly in relation to increasing the clear height of the draw spans to 23 feet above mean high water.

Subsequently this Board, in view of the great importance of this question to the maritime and transportation interests, prepared a plan for filling a portion of the river between Warren bridge and the Charles River dam, and for rebuilding the railroad bridges on stone piers with a slight increase in head room above the water and with draw openings of not less than 50 feet and a new alignment of draw openings. This plan was submitted to the board of engineer officers at a public hearing on June 23, 1909, and its features explained by the chairman. No report of this board has yet been made public.

HARBOR VIEW.

By chapter 141, Resolves of 1909, the commissioners were authorized to survey and dredge a channel in that part of Boston harbor called Harbor View, at such point as they may determine to be most suitable, the depth of the channel not to exceed 8 feet at mean low water. The sum of \$10,000 was appropriated, no work except the survey to be done until the owners of flats affected should release to the Commonwealth all claims for damages which might arise from the dredging; and, further, no work to be done, except the survey, unless the project shall be approved by the Board.

A survey was made and estimates of cost prepared.

Conferences have been held with the parties interested in this improvement, and they have undertaken to secure the necessary releases.

The Board has not yet approved the project.

Appropriation: —

Chapter 141, Resolves of 1909, \$10,000

The amount expended during the year is \$146, which was paid from the appropriation for the survey and improvement of harbors.

ORIENT HEIGHTS.

By chapter 109, Resolves of 1907, the Board was directed to dredge the channel in Boston harbor from the pier of the Orient Heights Yacht Club at East Boston 300 feet to connect with the channel running from Belle Isle Inlet to Thurston Street in East Boston, and to do other dredging in this locality, and authorized to expend therefor a sum not exceeding \$1,500.

It was found from the survey which was made that this appropriation was inadequate, and nothing further was done.

By chapter 134, Resolves of 1909, an additional appropriation of \$7,000 was made, and on July 14, 1909, a contract was entered into with J. P. O'Riorden to dredge a channel in the location above described, about 2,700 feet long, 30 feet wide on the bottom and 5 feet deep at mean low water. The contract price was $24\frac{3}{8}$ cents per cubic yard, measured in scows. This work was substantially completed in September, 1909, there now remaining but a small amount of dredging to be done for the removal of certain shoals. The total amount of excavation was 27,080 cubic yards.

Appropriations: —

Chapter 109, Resolves of 1907,	\$1,500
Chapter 134, Resolves of 1909,	7,000
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Total,	\$8,500

The amount expended during the year is \$5,336.52, which is also the total amount expended to Dec. 1, 1909.

COMMONWEALTH FLATS AT EAST BOSTON.

In 1897 this Board was authorized to take by purchase or otherwise certain land and flats on the easterly side of East Boston, for the purpose of securing public ownership and control of that portion of the foreshore of the harbor.

Several lots of flats near Jeffries Point were purchased, and in 1898 a taking was made, the largest area covered thereby being claimed as property belonging to the East Boston Com-

pany. The suit of this company, long pending, was in September, 1909, decided by the Supreme Judicial Court in favor of the Commonwealth, so far as relates to the title of certain flats. The company contended that under an ancient grant prior to the Colony Ordinance of 1647 the line of ownership extended much farther from the mean high water line than the Commonwealth conceded. There remains to be determined by the court the value of certain flats which the Commonwealth always supposed to be the property of this company.

Appropriation: —

Chapter 486, Acts of 1897, \$100,000

The amount expended during the year is \$2,503.

The total amount expended to Dec. 1, 1909, is \$35,084.27.

COMMONWEALTH'S LAND AND FLATS AT SOUTH BOSTON.

Information, in detail, concerning the Commonwealth's property known as the South Boston flats, may be found in the report of the Board for the year 1907, with maps of this territory.

On Aug. 24, 1909, a lease was made to the Grasselli Chemical Company of Massachusetts of 1,136.75 square feet of land westerly of L Street bridge, bounded in part by the southerly line of Summer Street and the sea wall on the northerly side of the Reserved Chammel, including a pile wharf 300 feet long and 50 feet wide now under construction by the Commonwealth, extending southerly from said sea wall to the line of the Reserved Channel.

This lease is for the term of ten years from May 1, 1910, the annual rental being \$3,100, the lessee to pay to the city of Boston the taxes assessed on the leased premises.

A contract for constructing this wharf was entered into on Oct. 8, 1909, with the L. Robert Tidd Company, the price being \$10,101. This work is now in progress, and is required to be completed by Jan. 31, 1910.

The contract for dredging the berth at the side of the wharf and an area in the Reserved Channel at the outer end of the wharf to a depth of 12 feet at mean low water was entered into on Oct. 8, 1909, with the Bay State Dredging Company, the contract price being 21¼ cents per cubic yard, measured in scows.

This work has been completed at a total cost of \$3,160.73.

During the fall the owners of the land on the southerly side of Summer Street, between D and E streets, which was sold by the Commonwealth in 1899, commenced the construction of a large wool warehouse.

There has been no work of improvement, other than as above stated, during the year.

COMMONWEALTH PIER.

This pier, built under authority of chapter 513, Acts of 1897, on the northerly frontage of the Commonwealth's flats, at a cost of about \$382,000, and covering about 11 acres, was completed in 1901, and is fully described in the report of the Board for the year 1907, with maps of location. On July 8, 1909, a portion of the easterly side of the pier was damaged by fire. The pier, and dock on the westerly side, have been used to a limited extent during the year, for the discharge and temporary storage of piles and lumber brought by vessels, and for other purposes, for which privileges payments amounting to \$1,080.12 have been made to the Commonwealth.

On Oct. 22, 1909, a contract was entered into with the Eastern Dredging Company to dredge to the depth of 35 feet at mean low water the dock on the easterly side of this pier, and an area opposite said pier and dock and lying between the pierhead line and the channel dredged by the United States Government; the areas to be dredged being 1,150 feet long and 150 feet wide in the dock, and about 500 feet long and 600 feet wide outside the pierhead line.

The amount of material to be removed is estimated to be about 350,000 cubic yards, scow measurement. The contract price is 15 $\frac{3}{10}$ cents per cubic yard, measured in scows, and it is provided that all work shall be completed by May 31, 1911.

The dock on the westerly side of this pier is 175 feet wide at the outer end, 200 feet wide at the inner end and 30 feet deep at mean low water.

NORTHERN AVENUE AND BRIDGE.

Northern Avenue, as laid out by chapter 381 of the Acts of 1903, from Atlantic Avenue across Fort Point Channel and

through the terminal yard of the New York, New Haven & Hartford Railroad Company to the division line between the lands of the railroad company and the Commonwealth, a distance of 2,803 feet, has been constructed by the city of Boston and is now open to public travel. The avenue and bridge from Atlantic Avenue to the harbor line on the South Boston side of the channel is 80 feet wide, and for the rest of its length the width is 100 feet.

The bridge over Fort Point Channel is 638 feet in length, with a draw opening of 75 feet in the clear.

Through the railroad yard a single sidewalk 8 feet wide is provided on the northerly side of the street, which is paved with brick and has a granite edgestone. The rest of the width of the avenue is paved with granite blocks with gravel joints. For the purpose of supporting the filling of the street on its northerly line at the heads of docks Nos. 1, 2 and 3, granite masonry walls have been erected, and at the proposed location of Pier 3 a timber bulkhead has been built; on these walls and on the bulkhead substantial fences have been placed.

Under the act of 1903 for laying out the avenue as a highway, the Railroad Commissioners have approved of the location of fourteen tracks crossing the avenue and of two longitudinal tracks in the center of the roadway extending from Sleeper Street to the lands of the Commonwealth. The cross tracks have been laid, but only that portion of the longitudinal tracks between the bridge and the first set of cross tracks leading to Pier 1 has as yet been laid.

The same act which laid out Northern Avenue also laid out Sleeper Street, connecting the avenue with Congress Street. The new portion of Sleeper Street, over the lands of the New York, New Haven & Hartford Railroad, which is 50 feet wide, has been constructed by the city and was opened to travel Oct. 28, 1908. The old portion of the street, which had been previously built and maintained by the railroad and the Boston Wharf Company, has been repaved.

The Commonwealth has paid \$260,000 towards the construction of this avenue and bridge, and will undoubtedly complete as soon as needed the paving of this avenue to a line in extension of the easterly side of the Commonwealth pier.

EAST BOSTON.

Under date of Jan. 16, 1909, the Board of Railroad Commissioners and the Board of Harbor and Land Commissioners, constituted a Joint Board by the provisions of chapter 134, Resolves of 1908, reported to the Legislature of 1909 on the subject of the development of railroad and water front facilities in the East Boston district of the city of Boston. (House, No. 291.)

BACK BAY LANDS.

On June 11, 1909, the Board, pursuant to the provisions of a mortgage deed from the Boston and Roxbury Mill Corporation to the Commonwealth, dated June 9, 1854, approved a request of said corporation to the Treasurer of the Commonwealth for a release and conveyance of certain land and flats on Charles River, in Boston, included in said mortgage deed, lying northerly of the harbor line in the rear of the houses fronting on Bay State Road, including all the land belonging to said corporation lying northerly of the harbor line and easterly of land formerly of the Riverbank Improvement Company and westerly of the flats of the Commonwealth, and also any land of said corporation not heretofore released and conveyed, lying between the northerly terminus of Raleigh Street and the harbor line.

On Oct. 15, 1909, a decree was entered by the Supreme Judicial Court, in the case of Amory A. Lawrence *et al.* v. George E. Smith *et al.*, in favor of the Commonwealth, ordering the removal of a fire escape from a passageway in the rear of 73 Newbury Street in the Back Bay district of the city of Boston.

ANGLE TREE MONUMENT.

By chapter 41, Resolves of 1908, this Board was authorized and directed to take such measures as may be necessary for the preservation of the "Angle Tree Monument," located between the towns of North Attleborough and Plainville, erected by authority of the General Court in 1790 to mark the boundary between the provinces of Massachusetts Bay and Plymouth. Conferences have been held during the year with parties interested in this matter; but, inasmuch as the owners of property

surrounding the monument have not as yet given to the Board the necessary right of way for the purpose of reaching and caring for the monument, further action has been delayed.

Appropriation: —

Chapter 41, Resolves of 1908, \$500

No expenditures have been made to Dec. 1, 1909.

ANNISQUAM RIVER AND LOBSTER COVE.

This river flows into Ipswich Bay on the northerly side of the city of Gloucester, and extends southerly across Cape Ann, one of its branches extending nearly into Gloucester harbor.

Before improvement by the Commonwealth there was 7 feet at mean low water over the bar, at the outlet of the river, and the channel, not less than 6 feet deep at mean low water, extended as far as Wolf Hill, about $1\frac{1}{2}$ miles from Gloucester harbor at the "Cut," so called.

The project for improvement as adopted in 1904 provided for the dredging of a channel 50 feet wide and 6 feet deep at mean low water from Gloucester harbor to Wolf Hill. This work was completed in 1907, and the river channel was marked by beacons and buoys, by the United States Lighthouse Establishment. The channel shoaled in places, and by chapter 122, Resolves of 1909, \$7,500 was appropriated for dredging and making such improvements as may be necessary to prevent the earth on the banks of the river from falling or washing into the same.

By chapter 131, Resolves of 1909, an appropriation of \$2,500 was made for a survey and for the improvement of Lobster Cove by dredging a channel thereto from the main channel of Annisquam River. As Lobster Cove is a tributary of Annisquam River, and the work to be done under both appropriations was of substantially the same character, it was deemed best to have both pieces of work done under one contract.

On Sept. 8, 1909, a contract was entered into with Jeremiah P. O'Riorden, providing for excavating nearly the whole length of the channel of this river from the Boston & Maine Railroad bridge to the Blynman or Cut bridge, and removing two shoals north of the railroad bridge, one near the bridge and one opposite Wolf Hill. This contract also provided for dredging a

channel 50 feet wide on the bottom and 6 feet deep at mean low water, extending from the channel of this river near the house of the Annisquam Yacht Club to the mouth of Lobster Cove opposite Fish Market wharf.

This work was completed Nov. 5, 1909, 40,939 cubic yards of material having been excavated and deposited at sea, at a total cost, including supervision and incidental expenses, of \$9,700.14.

Owing to the low price at which the contract was let, the Board was enabled to have the channel in Lobster Cove extended about 300 feet further into the cove than was originally planned.

Appropriations: —

Chapter 71, Resolves of 1903,	\$1,500 00
Chapter 88, Resolves of 1904,	50,000 00
Chapter 95, Resolves of 1908,	5,381 15
Chapter 122, Resolves of 1909,	7,500 00
Chapter 131, Resolves of 1909 (Lobster Cove),	2,500 00

Total,	\$66,881 15
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The amount expended during the year is \$8,858.75.

The total amount expended to Dec. 1, 1909, is \$65,707.19.

BASS RIVER, YARMOUTH.

The improvement of this river by the Commonwealth has been confined to its entrance channel. A survey was made in 1901, and at that time boats drawing about 5 feet could enter at mean high water through a very tortuous channel, but could not cross the bar except in comparatively smooth water. A report was made to the Legislature in that year (House, No. 1430), embodying a project for the construction of jetties, estimated to cost \$22,000. Two pile and timber jetties were built, the easterly one being 2,423 feet long and the westerly one 950 feet long, and a channel between them, across the flats, was dredged to 4 feet at mean low water. This work was completed in October, 1902, at a cost of \$22,800.50.

In 1903 the river channel was further improved by dredging, and the jetties protected with sand bags, the total cost of improvements to Dec. 1, 1903, being \$31,292.86.

In 1905 stone was placed along the sides of the outer portion of the eastern jetty and at the inner end of the western jetty.

An examination made during the spring of 1909 showed that the damage to the timber planking of the jetties, previously reported, had increased rapidly, that a section of about 125 feet of the easterly jetty had been undermined by the current scouring the sand from beneath it, and that it had been lifted by the extreme tides, leaving a large gap through which the tide flowed freely.

Under authority of chapter 123, Resolves of 1909, appropriating \$10,000 for extending and completing the improvement of this river, a contract was entered into on July 14, 1909, with the firm of Connolly Brothers of Barnstable, Mass., to fill in the gap referred to and to reinforce with stone riprap about 1,700 feet in length of the inner portion of the easterly timber jetty, the contract price being \$2.30 per ton for stone delivered in place. Already 2,250 tons of stone have been placed, at an expense of \$5,575.57, and the work is sufficiently advanced to prevent any further damage due to scouring effects of the water pouring through the damaged portions of the jetties.

At the inner end of the westerly jetty the sea washed away the sand, and a light timber fence protected by stone riprap is being built to prevent further damage in this locality.

The work now in progress will strengthen the timber jetties to such an extent that they will undoubtedly last for a number of years longer; but eventually it will be necessary to reconstruct them entirely of stone, of which the stone now being placed will form a portion of the core. In order to secure the greatest benefits and insure the same depth of water across the bar as is now maintained in the river, the jetties should be extended.

Appropriations: —

Chapter 39, Resolves of 1901,	\$500
Chapter 113, Resolves of 1901,	22,000
Chapter 46, Resolves of 1903,	15,000
Chapter 123, Resolves of 1909,	10,000
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Total,	\$47,500

The amount expended during the year is \$4,955.67.

The total amount expended to Dec. 1, 1909, is \$42,271.10.

BUCK'S CREEK, CHATHAM.

In 1904 a project was adopted embodying the construction of a pile and timber jetty on the westerly side of the mouth of Buck's Creek. This structure, 156 feet in length, was completed in 1905.

Under chapter 120, Resolves of 1909, this Board was directed to investigate the practicability and cost of dredging the mouth of this creek and the approaches thereto from Vineyard Sound, and of extending and otherwise improving the jetties, and to report thereon. This creek is the outlet of Taylors Pond, in the southwesterly part of the town of Chatham, and its outlet is used as a harbor by a fleet of 15 to 20 fishing boats, which are principally engaged during the winter in gathering scallops. It is sometimes known as Mill Creek.

At the entrance to the harbor there is a depth of but a few inches of water at low tide, and the drift sand along the beach is continually pushing the channel to the eastward.

The timber jetty was built on the westerly side of the entrance for the purpose of stopping, so far as it could be done, the drift of sand into the entrance to the harbor. The testimony of the fishermen is to the effect that by the construction of this jetty the drift of sand was stopped for a short time, and that the current maintained a straighter and better channel than had previously existed. During the last few years the sand has accumulated so fast that it has built out the beach to the outer end of the jetty. At the present time practically the whole of the sand drift along the beach is being washed into the channel, and is building out a point of sand which is again forcing the channel along the shore to the eastward and has caused it to shoal.

As in the case of most of the small harbors along this coast, the improvement is designed to prevent the entrance channel from being closed or shifted by the sand drifted along the beach, by building jetties substantially at right angles to the shore, and either dredging the channel between the jetties out to deep water, or allowing the tidal currents to scour such a channel. The plan which has been prepared is designed to carry out this idea and is as follows, viz: —

To extend the jetty which was built in 1904-05 southerly about 150 feet, and build a jetty about 200 feet long, parallel with the westerly jetty and about 100 feet distant from it; excavate a channel through the beach between the jetties, and close the existing outlet by a sand dike with its slopes protected by stone riprap. Two estimates have been made, which differ only in the amount of excavation proposed.

The first is for excavating a channel through the beach between the jetties down to the level of mean low water, using the material for constructing a dike across the old outlet.

The second is for excavating with a dredge a channel about 800 feet long, from the inner ends of the jetties out to a depth of about 4 feet at mean low water in the Sound, and at the inner end to extend the channel to form a basin where boats can lie at anchor, using the material to build up the banks and to construct a dike across the old outlet, the material excavated with the dredge to be deposited on the easterly side of the channel, as it would be practically impossible to place it in scows and tow it to sea. The estimates are as follows:—

Project No. 1:—

Excavation of 3,000 cubic yards, at 25 cents, . . .	\$750
Jetties and riprap, 3,000 tons of stone, at \$3, . . .	9,000
Supervision and incidental expenses, . . .	750
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Total,	\$10,500

Project No. 2:—

Dredging channel, 11,500 cubic yards, at 40 cents, . .	\$4,600
Jetties and riprap, 3,500 tons of stone, at \$3, . . .	10,500
Supervision and incidental expenses, . . .	900
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Total,	\$16,000

Appropriations:—

Chapter 102, Resolves of 1904,	\$1,000
Chapter 120, Resolves of 1909 (including Humarock Beach),	500
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Total,	\$1,500

The amount expended during the year is \$79.

The total amount expended to Dec. 1, 1909, is \$1,190.35.

CAPE COD CANAL.

Under the provisions of chapter 448 of the Acts of 1899, incorporating the Boston, Cape Cod & New York Canal Company, the Board of Railroad Commissioners and the Board of Harbor and Land Commissioners were constituted a Joint Board for the purposes defined in said act. The act of 1899 was amended by chapter 476 of the Acts of 1900.

A statement covering previous proceedings before this Board and the Joint Board, and actions taken on the several petitions presented, is contained in the report of this Board for the year 1907, pp. 98-104.

On June 21, 1909, notification was received from the Canal Company that the construction of the breakwater at the Barnstable Bay end of the canal had been commenced. This work is now in progress, and on Nov. 30, 1909, about 46,000 tons of stone had been placed in position. There has been, to the same date, about 230,000 cubic yards of material excavated in Barnstable and Buzzards bays.

On July 30, 1909, application was made by the Canal Company for a permit to dump the material dredged from the approach channel of the canal in Buzzards Bay, at the dumping ground in said bay, located about 1 mile west of West Falmouth harbor, prescribed by the district engineer officer of the United States stationed at Newport, R. I. A permit was subsequently granted, authorizing the dumping of approximately 1,500,000 cubic yards of material at the dumping ground aforesaid, subject to certain conditions.

On Sept. 24, 1909, application was made by the Canal Company for a permit to dump on the northerly side of the northerly breakwater at the Cape Cod Bay end of the canal, and in Cape Cod Bay in water not less than 10 fathoms deep, material excavated from the canal, as prescribed by the district engineer officer of the United States stationed at Boston, Mass.

On Oct. 1, 1909, a permit was granted authorizing the dumping of material in the locations prescribed as aforesaid, and subject to certain conditions and restrictions.

The Joint Board, on Nov. 6, 8 and 22, 1909, heard the petition of the Canal Company, filed Oct. 30, 1909, for determining

the method of crossing that part of the canal between the highway bridge at the Bourne railroad station and the highway bridge near the Buzzards Bay railroad station, at the points designated by the county commissioners of Barnstable County Oct. 26, 1909, and for the approval of plans therefor. Subsequently an order was passed by the Joint Board requiring the crossing of the canal to be made by a highway bridge at the points designated by the county commissioners. An amendment of the plans for the highway bridge was required by the Joint Board, and new plans for the same were filed by the Canal Company, increasing the width of the roadway and lowering the grade of approach.

Under section 22 of chapter 448, Acts of 1899, the Canal Company was obliged to begin the construction of the canal within three months from the date of the decision of the Joint Board determining at what point the railroad of the Old Colony Railroad Company should cross the canal. Construction was actually begun within the three months, but not actively continued, as is claimed, on account of the severe financial troubles in the fall of 1907. The actual work of construction was resumed in June, 1909, after nearly two years' delay.

The Joint Board is assured that financial arrangements have been made and contracts covering the principal construction work entered into, and that the canal will be completed within the five years from June 3, 1907, the date of the decision of the Joint Board in respect to the railroad crossing of the canal.

There may be accidents and unavoidable delays. Unless the canal is completed by June 3, 1912, the act shall be *null* and *void*, as provided by the statute. In view of the contingencies and the losses which might accrue, the Board recommends that some reasonable extension of the time, in the discretion of the Joint Board, be permitted for the completion of the canal; otherwise, although the construction was substantially completed, the Canal Company might be unable even to operate the canal, and both the company and the public thus be deprived of its use.

Since the decision of the Joint Board of June 3, 1907, aforesaid, it has been represented that it would be more convenient

for the travelling public and the residents at Buzzards Bay if a slight change were made in the location of the railroad crossing. The legal question has been raised whether or not the Joint Board, having once designated the place of crossing, can now alter the same. For the purpose of removing that uncertainty, the Board recommends that an amendment to the act be made, expressly authorizing the Joint Board to change the location for the crossing of the railroad, and also confirming in the Joint Board the right to exercise from time to time, with respect to other crossings over the canal, all the powers and authorities conferred upon the Joint Board by the statutes.

CHATHAM.

The Legislature, by chapter 126, Resolves of 1909, authorized and directed this Board to make a survey as to the necessity, advisability and cost of constructing sea walls, breakwaters or other structures to protect the town of Chatham from encroachments or damage by the sea, and directed that a report be made to the next General Court, and authorized the incurring of such expense as shall be approved by the Governor and Council. This resolve also authorized the expenditure of \$15,000 for necessary structures, if, after the survey is made, this Board should determine that immediate action is required for the protection of the town. In July, 1909, the commissioners, with the chief engineer, made an inspection of the shore lines and bluffs at and in the vicinity of the Hotel Mattaquason, the locality where protective work is desired, and heard statements of parties who have for years been familiar with the changing conditions at this place caused by the action of storms and tides. It was concluded to make a survey and estimate of cost of the protective work which appeared to be necessary. Plans and specifications were prepared, and on Aug. 6, 1909, the Board decided that immediate action was required for the protection of that portion of the town before the next session of the General Court, and voted that it was necessary and advisable to proceed with the work of rapping the slope of the bluff.

A contract was accordingly made with Messrs. Sears, Eldridge & Taylor for protecting the bluff on the easterly side of Watch

Hill and the low bluff stretching northerly from this point in front of the Hotel Mattaquason with granite quarry grout and chips, to prevent erosion by the sea. Releases were obtained from the owners of the property, protecting the Commonwealth from any claims for damages caused by the work.

Under this contract about 5,530 tons of stone have been placed on the faces of the bluff, the contract price being \$2.60 per ton. The work was to have been completed by Oct. 1, but owing to delays the last of the stone was not delivered until Nov. 27, 1909.

It was at first anticipated that the cost of the necessary work would be in excess of the appropriation of \$15,000, but as the work progressed the appropriation was found to be sufficient to cover the section where public interests would be most affected.

Appropriation: —

Chapter 126, Resolves of 1909, \$15,000

The amount expended to Dec. 1, 1909, is \$12,724.41.

CONNECTICUT RIVER.

By chapter 344 of the Acts of 1885, this Board was given the general care and supervision of the Connecticut River and its banks and of all structures therein, to prevent and remove unauthorized encroachments and causes of every kind which may in any way injure the river, and to protect and develop the rights and property of the public therein.

Long sections of the river bank have been protected under various appropriations made by the Legislature since 1888, mainly at Agawam, Hadley, Hatfield, West Springfield, and near Smith's Ferry in Northampton, now Holyoke.

The only work during the year has been the completion of that at Hadley, under the contract made with Daniel O'Connell's Sons on Aug. 9, 1907, and the protection of a section of the river bank near Smith's Ferry.

At Hadley the lower portion of the work which was done in 1888 and 1889 was injured by the river cutting under the foot of the mattresses and undermining the bank. Under Daniel O'Connell's Sons' contract stone riprap was placed to protect this section of the bank. This was completed on June 30, 1909, at a

cost of \$8,515.30. The bank is now in fair condition, but a considerable amount of additional stone will be required to make it fully secure.

At Smith's Ferry, under the appropriation of \$1,500 made by chapter 510 of the Acts of 1909, a section of the bank extending from a point about 30 feet north of the property of the Holyoke Canoe Club to a point opposite the Canoe Club House has been protected by being graded and covered with stone riprap, extending from the top of the bank to a point about 10 feet outside of the ordinary summer water line. The area protected is about 1,350 square yards, and the total cost of the work, including supervision and incidental expenses, was \$1,498.40. The stone was furnished by a contractor, delivered on the bank, and the grading and placing of it was done by day labor, all being under the immediate direction of E. E. Davis of Northampton.

In November, 1909, a survey was made of a portion of this river for the purpose of ascertaining the location and extent of changes which have occurred in its bank near the Mount Tom Junction station of the Boston & Maine Railroad, as a basis for further consideration of the question of certain protective work which may become necessary.

The appropriations for work on this river from 1888 to 1909, inclusive, amount to \$115,500.

The total amount expended to Dec. 1, 1909, is as follows: —

Agawam,	.	.	.	.	.	.	.	\$11,430	19
Hadley,	.	.	.	.	.	.	.	70,816	72
Hatfield,	.	.	.	.	.	.	.	6,700	75
West Springfield,	5,051	49
Smith's Ferry, Northampton,	1,524	20
Surveys and investigations,	2,788	01
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Total,	\$98,311	36

COTUIT HARBOR.

The improvement of the entrance to this harbor was authorized by chapter 124, Resolves of 1909, and the Board was directed to make the improvement in such manner as it may deem best, \$10,000 being appropriated for this purpose, in addition to \$5,000 previously appropriated.

Surveys have been made during the year at and near the entrance, and estimates of the cost of several projects have been made, but no conclusions have been reached.

Appropriations: —

Chapter 358, Acts of 1904,	\$5,000
Chapter 546, Acts of 1908,	5,000
Chapter 124, Resolves of 1909,	10,000
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Total,	\$20,000

The amount expended during the year is \$486.78, paid from the appropriation for the survey and improvement of harbors.

The total amount expended to Dec. 1, 1909, is \$2,647.45.

CUTTYHUNK HARBOR.

The plan of improvement adopted in 1905 comprised the construction of two stone jetties at the harbor entrance. Under appropriations made in that year and in 1907 these jetties were built, the northerly one about 1,025 feet in length and the southerly one about 500 feet in length. The outer end of each jetty reaches to about the crest of the bar at the entrance to the channel.

By chapter 132, Resolves of 1909, \$10,000 was appropriated in addition to amounts heretofore authorized, to be expended for the improvement of this harbor, provided that no part of the money appropriated by this resolve should be expended unless the town of Gosnold should pay into the State treasury \$5,000, and secure land for a public landing place on the shore of the harbor.

The town having received a deed for a lot of land suitable for a public landing, and arranged to pay the required sum into the State treasury, plans and specifications were prepared for dredging a channel 60 feet wide on the bottom and 12 feet deep at mean low water, extending from the outer harbor to deep water just inside the Narrows at the entrance to Cuttyhunk Pond, a distance of about 2,200 feet, and for dredging to the same depth a turning basin 300 feet long and 150 feet wide at the inner end of the channel.

On Nov. 26, 1909, proposals were received for dredging a

channel and anchorage basin, the lowest being \$15,600. The contract for this work has not yet been executed.

Appropriations: —

Chapter 33, Resolves of 1900,	\$1,000
Chapter 450, Acts of 1905,	5,000
Chapter 542, Acts of 1907,	7,500
Chapter 142, Resolves of 1908,	7,500
Chapter 132, Resolves of 1909,	10,000
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Total,	\$31,000

The amount expended during the year is \$507.52.

The total amount expended to Dec. 1, 1909, is \$15,201.95.

DEACON'S POND, FALMOUTH.

The dredging of a channel from Vineyard Sound into Deacon's Pond and of a basin in said pond for anchorage purposes, also the work of building two stone jetties at the entrance channel, under authority of chapter 461, Acts of 1906, and chapter 495, Acts of 1907, was completed early in 1909. The entrance channel was dredged to a width of 150 feet on the bottom and 7 feet deep at mean low water, and an anchorage basin dredged to the same depth over an area of about 4 acres located above and below a portion of the highway, formerly Clinton Avenue, but now discontinued and the roadway removed.

In October, 1909, a small additional amount of stone was placed on the westerly jetty, where a slight settlement had occurred.

Appropriations: —

Chapter 495, Acts of 1907,	\$25,000
By the town of Falmouth,	10,000
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Total,	\$35,000

The amount expended during the year is \$13,543.51.

The total amount expended to Dec. 1, 1909, is \$35,007.

DREDGING EASTERLY SHORE OF DORCHESTER.

That portion of Dorchester Bay between Commercial Point and Savin Hill has been improved by dredging under various

appropriations made by the Legislature, beginning in the year 1904 when an anchorage basin covering an area of about $4\frac{1}{2}$ acres was dredged in the flats adjoining the main channel of Neponset River to 9 feet at mean low water, and the channel leading from that main channel to the wharves on the northerly side of Commercial Point was enlarged by dredging the same for a length of about 700 feet, 75 feet wide on the bottom and 12 feet deep at mean low water. In 1905 and 1906 the channel dredged in 1904 was extended, 75 feet wide and 12 feet deep at mean low water, providing a channel 1,900 feet in length from deep water off the wharf of the gas company at the end of Commercial Point to Doherty's wharf. A narrow cut, deep enough to float row boats at low water, was also dredged to the float of the public landing at Commercial Point.

In 1906 and 1907 the anchorage basin dredged in 1904 was enlarged by dredging over an area 500 feet in length and 400 feet in width, to a depth of 9 feet at mean low water.

In 1908 and 1909 the anchorage basin was further enlarged by dredging to the depth of 9 feet at mean low water two other areas, one about 1,100 feet long and 265 feet wide, lying north-west of the channel and extending between the anchorage basin dredged by the Commonwealth in 1904 and the channel dredged by the Savin Hill Yacht Club in 1907, the northerly limit being 225 feet inside of and parallel with the harbor line, the second area being at the intersection of the channel dredged in 1904 and the anchorage basin dredged in 1907. All work under contract was completed in May, 1909. The amount dredged was 146,132 cubic yards, which is in excess of that originally planned, and has resulted in providing an increased area of $9\frac{1}{3}$ acres of anchorage basin for use by yachts and small boats.

Appropriations: —

Chapter 439, Acts of 1903,	.	.	.	.	.	\$25,000
Chapter 453, Acts of 1905,	10,000
Chapter 454, Acts of 1906,	10,000
Chapter 488, Acts of 1907,	25,000
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Total,	\$70,000

The amount expended during the year is \$21,823.65.

The total amount expended to Dec. 1, 1909, is \$70,171.31.

EAST BAY, OSTERVILLE.

This bay, at Osterville in the town of Barnstable, covers an area of about 88 acres, and Centreville River, with its tributaries, whose waters flow into the bay, covers a slightly larger area.

The greatest depth of water in the bay before improvement was about 4 feet, and the area having a depth exceeding 2 feet at mean low water was about 9 acres. The outlet into Nantucket Sound was through a shifting sand beach. In 1903 and 1904 a channel was excavated through the beach into the Sound, two stone jetties built, stone riprap placed upon the banks of the cut through the beach, and the old outlet closed. In 1905 a portion of the beach was protected with stone riprap and a sand dike built at the old outlet.

The work under a contract with Cavanagh Brothers, dated July 17, 1908, for excavating a channel 150 feet wide and 4 feet deep at mean low water, from the channel between the jetties into the deep water on the northerly side of the bay, and for dredging a channel 100 feet wide between the jetties and 4 feet deep at mean low water into the Sound, was completed June 9, 1909.

On Dec. 16, 1908, a contract was entered into with Connolly Brothers to furnish and place about 700 tons of stone riprap on the beach to the east of the entrance channel to the bay, the contract price being \$2.40 per ton. This work was completed in March, 1909.

By the action of the sea and ice, the stone jetties at the entrance to the bay were flattened out so that the sea was driving the sand from the beach to the westward over the westerly jetty into the channel. In order to prevent this a timber fence was built back of the westerly jetty, effectually stopping the drift of the sand over the jetty into the harbor. The easterly side of this fence was protected by throwing up against it a portion of the stones from the jetty.

In October, 1909, a channel about 200 feet long, 50 feet wide and about 4 feet deep at mean low water, was dredged from the deep water of the bay towards the shore at the public landing at

the westerly end of the bay, to enable boats to approach the wharf at this point at all stages of the tide.

The cost of all the above work, including supervision and incidental expenses, was \$9,985.73.

The present condition of the work done is satisfactory, but both jetties should soon be built up and extended with heavy stone, in order to prevent them from being still further injured by the sea.

Appropriations: —

Chapter 96, Resolves of 1899 (including Witchmere harbor and Lewis Bay),	\$1,500
Chapter 376, Acts of 1903,	6,500
Chapter 115, Resolves of 1908,	10,000
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Total,	\$18,000

The amount expended during the year is \$7,324.20.

The total amount expended to Dec. 1, 1909, is \$18,874.58.

GREEN HARBOR.

By chapter 585, Acts of 1908, the Board of Harbor and Land Commissioners and the State Board of Health were constituted a Joint Board for the purpose of examining Green Harbor in the town of Marshfield, and the dam and dike constructed under the provisions of chapter 303, Acts of 1871, and directed to report to the next General Court. This report (House, No. 1399) was made and submitted March 12, 1909.

HERRING RIVER, HARWICH.

The project adopted in 1905 for the improvement of the mouth of this river provided for the construction of two stone jetties; for the excavation of a new channel through the beach, 75 feet wide on the bottom, to the level of mean low water; for riprapping its banks with stone; and for constructing an embankment or dike across the old outlet so that the river would be turned into the new outlet through which it would scour a straight channel at least as large as the existing one. This work was completed in 1905.

In 1906 about 200 tons of stone were deposited as riprap on the beach east of the easterly jetty.

By chapter 499, Acts of 1909, the Board was authorized to dredge the mouth of this river and the approaches thereto from Vineyard Sound, and to extend the jetty or jetties therein, and otherwise improve the same, the appropriation therefor being \$10,000.

An examination and survey was made, showing that the channel had a depth of about 18 inches over the bar at low water, and that the jetties, which were composed of comparatively small stones, had settled and been flattened out by the action of the sea.

After conferring with fishermen and others who used the harbor, it was decided that the best method of improving the entrance was to raise and strengthen the existing jetties and extend them with granite quarry grout and chips, as far as practicable under the appropriation.

On Nov. 26, 1909, a contract for this work was entered into with William Sears & David A. Eldridge, the contract price being \$2.60 per ton.

Appropriations: —

Chapter 66, Resolves of 1901,	\$500
Chapter 399, Acts of 1905,	10,000
By the town of Harwich,	2,000
Chapter 499, Acts of 1909,	10,000
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Total,	\$22,500

The amount expended during the year is \$179.43.

The total amount expended to Dec. 1, 1909, is \$12,628.40.

HERRING RIVER DIKE, WELLFLEET.

By chapter 183, Acts of 1908, the Board was authorized and directed to construct a dike, with ditches and structures incident thereto, at or near the mouth of Herring River in Wellfleet.

A survey was made and plans and specifications prepared, and, on April 24, 1908, a contract was entered into with Thomas & Connor of Middleborough, Mass., to build this dike. Work

was commenced, but was suspended in the fall of 1908. It was recommenced in the spring of this year, and the dike was finally closed on Sept. 20, 1909.

The embankment has been completed, the only work now remaining to be done being the placing of the stone and sod facing on the slopes of the dike and finishing the roadway on the top.

In addition to the contract requirements, it was found advisable to place a small amount of heavy stone to prevent the water which flows through the sluices from scouring out the bottom and undermining the dike.

Appropriations: —

Chapter 183, Acts of 1908,	\$10,000
By the town of Wellfleet,	10,000
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Total,	\$20,000

The amount expended during the year is \$7,725.15.

The total amount expended to Dec. 1, 1909, is \$15,329.23.

HINGHAM HARBOR.

By chapter 125, Resolves of 1909, the sum of \$5,000 was appropriated, in addition to \$5,000 appropriated in 1908, for dredging an anchorage basin in this harbor. The town of Hingham is authorized to appropriate \$3,000 and pay the same into the State treasury, to be expended under the direction of this Board for the purpose of aiding the Commonwealth in carrying out the work provided for in the resolve.

In 1908 a project was prepared for the improvement of this harbor, the estimated cost being \$23,700. It appearing that in 1907 the federal government had made an appropriation of \$10,000 to be expended in this harbor, and as a portion of the project above named was within the area which it was planned to improve under the appropriation by the government, arrangements have been made for doing the work jointly whenever the town of Hingham makes its appropriation, thereby securing the greatest improvement possible. The town has not yet made its appropriation.

Appropriations: —

Chapter 109, Resolves of 1908,	\$5,000
Chapter 125, Resolves of 1909,	5,000
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Total,	\$10,000

The total amount expended to Dec. 1, 1909, is \$13.74.

HUMAROCK BEACH, SCITUATE.

By chapter 120, Resolves of 1909, the Board was directed to investigate the practicability and cost of building a sea wall at this beach, in Scituate, and authorized to expend for this purpose (and for an investigation of Buck's Creek in Chatham) the sum of \$500.

An examination and survey of the locality was made under the direction of the chief engineer.

This beach is located near the old mouth of the North River, which forms a portion of the boundary between the towns of Marshfield and Scituate. The approach to the beach is through the town of Marshfield and over a pile bridge crossing the North River. The beach is a narrow ridge of sand about 1,000 feet across, and the portion which it is desired to protect lies opposite the bridge, and extends about 2,000 feet north and 1,500 feet south of Sea Street, which extends directly from the bridge to the easterly shore.

There are 31 cottages along this section of the beach, and 27 of them are bunched together north and south of Sea Street, covering a frontage of about 2,500 feet.

The improvement desired is the construction of a sea wall to prevent the sea from cutting through and undermining the cottages along the beach. In order to furnish this protection a sea wall will have to be built substantially in the form of the wall which was built by the Commonwealth at North Scituate in 1908, viz.: a wall of concrete, 9 feet high, 4 feet 6 inches wide on the bottom and 2 feet wide on the top, and having a lip or projection on the top of the face, 6 inches wide and about 6 inches deep; and to protect the foundation of this wall, spur jetties of concrete about 4 feet high, projecting 40 feet from the wall and about 100 feet apart.

The cost of building such a wall about 2,500 feet long, with spur jetties, which would protect all but 4 of the cottages, is estimated as follows:—

2,500 lineal feet of sea wall along the crest of the beach, at \$8,	\$20,000
26 spur jetties, at \$100,	2,600
Supervision and incidental expenses,	2,000
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Total,	\$24,600

If the other 4 cottages are to be protected, the estimate will have to be increased about 40 per cent.

Appropriation:—

Chapter 120, Resolves of 1909 (including Buck's Creek),	\$500
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The amount expended during the year is \$236.07.

LYNN HARBOR.

By chapter 110, Resolves of 1908, the Board was directed to excavate an anchorage basin in Lynn harbor outside the proposed location for Market Street extension.

On Nov. 19, 1909, proposals were received for dredging, to the depth of 6 feet at mean low water, an anchorage basin about 350 feet square, on the easterly side of the channel leading to the wharf of the People's Coal Company, and for dredging to the same depth a channel 100 feet wide extending from this basin to deep water in the main channel dredged by the United States, — all the work to be outside the proposed location for Market Street extension. Up to Dec. 1, 1909, releases have not been received from the riparian owners. The work cannot proceed until releases have been obtained and filed with the Board.

Appropriation:—

Chapter 110, Resolves of 1908,	\$10,000
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By chapter 501, Acts of 1909, the Board was authorized and directed to examine Lynn harbor, the approaches thereto, the

channels therein and the flats and foreshore thereof, to make surveys, and especially to examine any plans, details and projects for the development of this harbor which may be submitted by the city of Lynn, and to report to the Legislature by Jan. 10, 1910.

A survey has been made under the direction of the Board, and the city of Lynn was asked to submit the results of its investigation looking to the development of this harbor. Plans and a report accompanying the same were submitted by the city on Nov. 17, 1909, and on Nov. 26, 1909, after notice by publication, a public hearing was given.

Owing to the late date of the filing of these plans, it was not possible for the Board to make report on this important subject to the Legislature in its annual report ending Nov. 30, 1909.

Appropriation: —

Chapter 501, Acts of 1909,	\$1,000
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The amount expended on account of this harbor during the year is \$149.90, of which \$146 was paid from the appropriation for the survey and improvement of harbors.

MENAMSHA INLET.

In November, 1908, the Board, acting under authority contained in chapter 1, section 6, Revised Laws, and in accordance with the application of Lieut.-Col. Edward Burr, Engineer of the Second Lighthouse District, conveyed to the United States the title to the two tracts of land lying under the outer ends respectively of the two jetties built by the Commonwealth at Menamsha Inlet, covered by navigable waters, for the purpose of erecting beacon lights or other aids to navigation thereon; together with a right of way over land of the Commonwealth and over said jetties to the tracts conveyed. This conveyance was approved by the Governor and Council Dec. 2, 1908.

PENIKESE ISLAND.

The pile wharf which this Board was directed to build at Penikese Island in Buzzards Bay, in extension of the existing stone wharf on the easterly side of the main part of the island,

by authority of chapter 118, Resolves of 1908, was completed Jan. 2, 1909, and has been turned over to the State Board of Charity, as required by said resolve. Inasmuch as certain claims against the contractor filed with the Board have not been adjusted, final payment has not been made under the contract.

The total cost of the work, including supervision and incidental expenses, was \$4,851.30.

Appropriation: —

Chapter 118, Resolves of 1908,	\$5,000
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The amount expended during the year is \$3,238.92.

The total amount expended to Dec. 1, 1909, is \$3,367.30.

By chapter 93, Resolves of 1909, the Board was directed to make a survey of the entrance to Penikese Island, and to make a report with an estimate of cost of dredging a channel not less than 150 feet wide and 12 feet deep at mean low water from the wharf built by the Commonwealth to the channel between Cuttyhunk and Penikese Islands.

A survey was made covering an area about 1,500 by 2,500 feet on the southeasterly side of the island, and including the shoal water between the wharf and the deep-water channel referred to in the statute.

The estimate for excavating a channel about 650 feet long from the outer end of the wharf southeasterly to deep water, 150 feet wide and 12 feet deep at mean low water, and for excavating a berth 100 feet wide and 12 feet deep at mean low water on both sides of the wharf for a distance of about 175 feet from the outer end of the wharf, is as follows: —

36,000 cubic yards of material excavated, at 40 cents,	\$14,400
Supervision and incidental expenses,	600
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Total,	\$15,000

Appropriation: —

Chapter 93, Resolves of 1909,	\$300
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The amount expended during the year is \$194.65.

PLYMOUTH HARBOR.

The dredging of a channel in this harbor, from the “ Cow Yard ” to the Plymouth Cordage Company’s wharf, authorized by chapter 531, Acts of 1907, is now in progress, under a contract with the Eastern Dredging Company, dated Sept. 4, 1908, the estimated amount of material to be excavated being 700,000 cubic yards.

The inner channel, 150 feet wide and 18 feet deep at mean low water, which constitutes the main portion of the work, has been dredged to its full width and depth for a distance of about 4,000 feet, and now extends to within about 800 feet of the Cordage Company’s wharf. Work on the outer channel, which is to be about 1,100 feet long, 250 feet wide and 20 feet deep at mean low water, has not been commenced.

To Dec. 1, 1909, 490,339 cubic yards have been excavated and deposited at sea, and it is expected that the work will be completed well within the contract time, — Oct. 1, 1910.

The cost of this improvement up to the sum of \$160,000 is to be paid one-half by the Commonwealth and one-half by the town of Plymouth.

Appropriations : —

Chapter 95, Resolves of 1906,	\$400
Chapter 531, Acts of 1907,	80,000
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Total,	\$80,400

The amount expended during the year is \$69,457.04.
The total amount expended to Dec. 1, 1909, is \$70,808.28 ; of which \$33,148.64 has been paid by the town of Plymouth.

PROVINCE LANDS.

The reclamation of the territory belonging to the Commonwealth, known as the Province Lands, located in Provincetown and containing about 3,290 acres, has been in progress under the direction of the Board since 1893. The method adopted for this work is the planting of beach grass, shrubs and trees to cover and hold the blowing sands, and has been fully described in previous reports.

The work of removing brown-tail moths was resumed in March

of this year. During the spring about 5,000 small pines were transplanted, also about 15,000 seedling pines, 150 silver oaks and about 3,000 hills of Scotch broom, with good results, considering the extreme drought of last summer.

About 7 acres of sand dunes were covered with brush during this period, and a small amount of bayberry was planted.

In the fall the work of transplanting grass and bayberry was resumed, resulting in the covering of about 16 acres of sand. The remaining portion of the uncovered sand dunes amounts to approximately 135 acres.

In the treatment of these lands since 1895 it has been demonstrated that excellent results have been obtained by planting beach grass (*Ammophila arenaria*) and Scotch broom (*Genista scoparia*); good results from the use of black alder (*Ilex verticillata*), oaks grown from the planting of acorns, white birch (*Betula alba*), yellow birch (*Betula lutea*), hardhack (*Spiraea tomentosa*), silver oaks (*Quercus alba*), when planted in the sod; fair results from the planting of mountain cranberry vine, and no favorable results from the use of tamarisk (*Gallica*), hornbeam (*Corpinus betulus*), California privet (*Ligustrum vulgare*), willow, beach plum (*Prunus maritima*) and cedars.

About 75 per cent. of seedling native pines, seedling Scotch pines and seedling Austrian pines live; also about 50 per cent. of seaside pines. About 95 per cent. of pines, on the sod, and bayberry, live.

The State road has required only a comparatively small amount of repairs during the year to keep it in good condition for travel.

The sum of \$151.56 has been paid into the State treasury during the year, being the amount received from licenses which have been issued to various parties to cultivate and pick cranberries in the bogs on these lands, and to mow meadow lands.

Appropriations: —

1893-1905, inclusive, aggregate,	.	.	.	.	\$48,000
Chapter 545, Acts of 1908,	.	.	.	.	10,000
Total,	.	.	.	.	\$58,000

The amount expended during the year is \$2,194.92.

The total amount expended to Dec. 1, 1909, is \$50,278.16.

REVERE BREAKWATER.

The project adopted in 1906 provided for the construction of a breakwater about 1,000 feet long, with a shore arm about 400 feet long extending from its southerly end along the crest of Cherry Island Bar in the town of Revere, the material to be granite quarry grout in large blocks.

Under a contract with the Rockport Granite Company of Massachusetts and the Pigeon Hill Granite Company, jointly, dated Feb. 18, 1907, 361 feet in length of the shore arm of the breakwater, 910 feet in length of the main breakwater, and a beacon of large stones projecting well above the general level of the top of the main portion of the breakwater, have been built. Half Tide Rock, and several bowlders near it which obstructed the basin, have been removed. As stated in the report of the Board for 1908, the actual settlement of the breakwater was largely in excess of what was anticipated, and, so far as the appropriation would allow, additional stone has been placed during the year to raise a portion of the structure and to replace stones which were displaced by heavy storms. Owing to lack of funds, the breakwater, at present, for a length of about 100 feet from its northerly end, is 6 feet lower than planned.

All work under contract was completed April 17, 1909, the total cost, including supervision, incidental expenses, and \$300 paid for removing rocks, being \$54,990.84.

Appropriations: —

Chapter 108, Resolves of 1905,	\$25,000
Chapter 99, Resolves of 1906,	30,000
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Total,	\$55,000

The amount expended during the year is \$10,419.15.

The total amount expended to Dec. 1, 1909, is \$54,990.84.

ROCK HARBOR.

The contract entered into with John H. Gerrish on Aug. 5, 1907, for improving Rock Harbor in the towns of Orleans and Eastham, by dredging, was completed Sept. 9, 1909.

Owing to the inability of the contractor to get proper machin-

ery at the time, the work was delayed until this year, although previous attempts had been made to do the work with an hydraulic dredge and also with teams.

At the request of the fishermen who use the harbor, and as the contractor found that it could be done to better advantage in that way, the outer portion of the channel was excavated directly across the marsh, giving a more direct entrance than was originally planned, but requiring the excavation of a considerably larger amount of material. The change in plans was made without any increase in the contract price, and the contractor excavated the channel to a depth about 2 feet greater than that specified in the contract, so that the improvement is considerably in excess of what was expected when the work was designed.

The channel as completed is about 1,300 feet long, 50 feet wide on the bottom and excavated to the plane of mean low water, which, owing to the elevation of the flats outside, gives a depth of about 4 feet in the channel at low water.

The excavated material was piled on the banks, well back from the channel, and since the completion of the work the town has leveled back this material away from the channel, thereby greatly improving the appearance, and placing the material so far back that there is far less opportunity for the sea to wash it back into the channel.

The total cost, including supervision and incidental expenses, was \$5,011.60.

Appropriations: —

Chapter 25, Resolves of 1907,	\$200
Chapter 116, Resolves of 1907,	5,000
	<hr/>
Total,	\$5,200

The amount expended during the year is \$4,575.

The total amount expended to Dec. 1, 1909, is \$5,196.06.

SCITUATE.

Sea walls and other works for protecting the shores and harbor of the town of Scituate were built by the Commonwealth during the period 1900 to Dec. 1, 1908, as follows: 998 feet of concrete

sea wall, built in 1900, along the crest of the narrow beach at the Sand Hills between Scituate harbor and the ocean; 1,450 feet of concrete sea wall, built in 1902, along the crest of the beach between Damon's Island and the Glades at North Scituate; three sea walls, built in 1906-07, one 357 feet in length to replace a timber bulkhead along the easterly side of Beach Street in front of the Cliff House at North Scituate, one 356 feet in length in extension southerly of wall opposite Surfside Road at North Scituate, and one 700 feet in length along the crest of the beach at the southerly end of the First Cliff; stone riprap for the protection of the last-named wall where it joined the First Cliff; stone riprap for the bluff at the southerly end of the Third Cliff; 1907-08, stone riprap for protecting the bluff at the southerly end of the Third Cliff; 280.54 feet of concrete sea wall near Surfside Road; and 369.52 feet of concrete sea wall near Beach Street, at North Scituate.

By chapter 498, Acts of 1909, authority was given to repair structures already built, or to make such connections between the same as in the judgment of the Board may be necessary, at an expense not exceeding \$1,500.

On Sept. 8, 1909, a contract was entered into with Rendle & Stoddard to build a concrete sea wall at North Scituate beach in the gap between the wall built by the Commonwealth in 1908, extending southerly from Beach Street, and the wall built by private parties near Surfside Road, the contract price being \$5 per lineal foot of wall.

This work was completed Oct. 28, 1909, 278.8 feet of wall having been built, at a cost, including supervision and incidental expenses, of \$1,524.25.

Appropriations: —

Chapter 434, Acts of 1900,	. . . . .	\$15,000
Chapter 496, Acts of 1906,	. . . . .	15,800
Chapter 544, Acts of 1907,	. . . . .	6,000
Chapter 498, Acts of 1909,	. . . . .	1,500
Total,		<hr/> \$38,300

The amount expended during the year is \$1,124.25.

The total amount expended to Dec. 1, 1909, is \$36,873.51.

SESUIT HARBOR.

The construction of a stone jetty at this harbor, in East Dennis, under authority of chapter 557, Acts of 1908, was commenced during the year and completed on Aug. 31, 1909, under a contract entered into on Oct. 26, 1908, with Wm. Sears, the contract price being \$1.90 per ton.

The portion which has been built extends from the shore to the gap in the old jetty, about 630 feet from the bluff at the inner end of the jetty. The structure is apparently accomplishing the purpose for which it was built, the current being so directed by the jetty that it is now cutting a channel straight out from the shore to deep water, instead of winding around across the beach, as it did formerly.

The total cost, including supervision and incidental expenses, was \$10,057.95.

Appropriations: —

Chapter 32, Resolves of 1907,	\$200
Chapter 557, Acts of 1908,	10,000
	<hr/>
Total,	\$10,200

The amount expended during the year is \$10,038.70.

The total amount expended to Dec. 1, 1909, is \$10,240.20, of which a portion was paid from the appropriation for the survey and improvement of harbors.

SOUTH RIVER, SALEM.

By authority of chapter 111, Resolves of 1907, the sum of \$3,000 having been contributed and deposited with the Commonwealth under the provisions of said resolve, a contract was entered into on Dec. 14, 1908, with the Eastern Dredging Company, to dredge a channel in South River, 75 feet wide and 8 feet deep at mean low water, from about 200 feet below Union Street bridge a distance of about 1,300 feet towards Lafayette Street.

This work was completed April 24, 1909. In addition to the dredging, two large bowlders which were uncovered were removed at a cost of \$75.

The total cost, including supervision and incidental expenses, was \$7,939.01.

Appropriations: —

Chapter 111, Resolves of 1907,	\$5,000
Deposit with State Treasurer,	3,000
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Total,	\$8,000

The amount expended during the year is \$7,939.01.

The total amount expended to Dec. 1, 1909, is \$8,097.67.

TOWN BOUNDARY SURVEY.

The work of determining the location of the town boundaries has been continued with the same organization as in the last few years.

One field party completed the survey of a group of towns, bounded southerly by Connecticut and westerly by the Connecticut River, on which they were engaged the previous year. This party has also completed about one-half the field work on another group of towns in the middle section of the State, bounded westerly by the Connecticut River.

Another party was employed in locating the boundaries of a group of 28 towns lying along the northern boundary of the State, and extending from the Connecticut River to the New York line.

As in previous years, some difficulty has been experienced, due to delays on the part of the town officers in placing proper marks at angles in the town lines where the old bounds were either indefinite or had been destroyed.

During the year the location of 167 points, marking angles in town lines, and 218 survey points, mostly on the summits of hills, have been determined by triangulation. Topographical surveys have been made of 79 miles of rivers and streams, principally the Deerfield, Cold, North, Swift, Ware and Quabaug rivers, and Pelham, Shelburne and Lambertons brooks, which form portions of the town boundary lines; also, 42½ miles of highway and 39 miles of railroad have been surveyed, where they formed portions of boundary lines or were incidental to the other surveys. Topographical surveys have also been made of town boundary lines, where they were very crooked and where the town officers had expressed a desire to have them straightened.

During the year the Board has proposed the straightening of two crooked boundary lines, which had been previously surveyed. One of these was concurred in by both towns, and will be submitted to the Legislature for action. The other was approved by one of the abutting towns, but concurrence was refused by the other town. This latter line is very crooked, containing 56 angles, 4 of which are wholly unmarked. At the request of the Board, the Attorney-General notified the town officers to properly mark the line as it now exists, but no action has been taken by the towns up to the present time.

One atlas, describing the boundaries of 22 cities and towns, viz., Auburn, Blackstone, Charlton, Douglas, Dudley, Grafton, Hopedale, Hopkinton, Leicester, Mendon, Milford, Millbury, Northbridge, Oxford, Shrewsbury, Spencer, Sutton, Upton, Uxbridge, Webster, Westborough and Worcester, which was printed the previous year, has been received from the printer and distributed. Another atlas, containing descriptions of the boundaries of 21 cities and towns, viz., Ashburnham, Ashby, Athol, Bernardston, Erving, Fitchburg, Gardner, Gill, Leominster, Lunenburg, Montague, Northfield, Orange, Phillipston, Royalston, Templeton, Townsend, Warwick, Wendell, Westminster and Winchendon, has been in the hands of the printer since March 5, 1909.

Up to Dec. 1, 1909, atlases describing the boundaries of 227 cities and towns, out of a total of 354 in the Commonwealth, have been completed and distributed as provided by statute. Another atlas, containing the descriptions of the boundaries of 21 cities and towns, was in the hands of the printer. The field work for another group of 22 cities and towns has been completed, with the exception of the determination of a few corners which are now unmarked, and the material is now being prepared for publication, but this publication will be delayed until such time as the town officers properly mark the points, in order that their location may be determined.

VINEYARD HAVEN HARBOR.

Previous to Dec. 1, 1908, a stone breakwater 830 feet in length was built by the Commonwealth on the westerly side of this harbor north of the steamboat wharf, to protect the anchor-

age ground used by fishing boats and other small craft. By chapter 500, Acts of 1909, the Board was directed to extend this breakwater, and, if found advisable, to build on the shore of the harbor opposite the westerly end of the breakwater such jetties as may be necessary to protect the shore and the entrance to the anchorage basin around the western end of the breakwater. The appropriation was \$10,000. An inspection of the harbor and breakwater was made in July, 1909, and after making a survey to determine what changes, if any, had taken place in the shore line, a contract was entered into on Aug. 6, 1909, with E. S. Belden & Sons of Hartford, Conn., to extend this breakwater at either end. The shore owners objected to the construction of a jetty. The contract price was as follows: for stone furnished and placed in breakwater, \$1.23 per ton; for each iron clamp furnished and secured in place, \$5; for stone placed in the jetty, \$1.53 per ton. The breakwater was extended 183 feet at its outer end and 200 feet at its inner end under this contract, making the total length of breakwater 1,213 feet. All work, with the exception of the iron clamps in the beacons at the outer ends of the structure, was completed Nov. 1, 1909.

The total cost, including supervision and incidental expenses, was \$9,996.72.

Appropriations: —

Chapter 95, Resolves of 1904,	. . . . .	\$500
Chapter 442, Acts of 1905,	. . . . .	10,000
Chapter 526, Acts of 1908,	. . . . .	10,000
Chapter 500, Acts of 1909,	. . . . .	10,000
Total,	. . . . .	<hr/>\$30,500

The amount expended during the year is \$8,561.44.

The total amount expended to Dec. 1, 1909, is \$28,796.58.

WEST BAY, OSTERVILLE.

The work of widening the entrance at West Bay, Osterville, under contract with J. H. Gerrish, dated Sept. 6, 1907, was completed Jan. 14, 1909. A few stones forming a part of the old jetty were buried in the sand, and were not found and removed until a later date.

The total cost, including supervision and incidental expenses, was \$9,807.13.

The timber work of the easterly jetty has been badly eaten by worms and it will soon be necessary, in order to preserve the entrance, to reconstruct or strengthen the outer portion of this jetty with stone.

Appropriations: —

Chapter 483, Acts of 1897,	. . . . .	\$8,500
Chapter 440, Acts of 1898,	7,500
Chapter 491, Acts of 1902,	7,500
Chapter 523, Acts of 1907,	10,000
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Total,	\$33,500

The amount expended during the year is \$3,998.24.

The total amount expended to Dec. 1, 1909, is \$39,507.02, of which a portion was paid from the appropriation for the survey and improvement of harbors.

WEST FALMOUTH HARBOR.

Under an appropriation made in 1907, a channel 50 feet wide and 6 feet deep at mean low water was excavated from deep water west of Abbots Point to the town landing.

On Aug. 14, 1908, a contract was entered into with John H. Gerrish to excavate a channel 50 feet wide and 6 feet deep at mean low water through the bar at the entrance to the harbor, and to excavate an anchorage basin about 300 feet wide and 350 feet long, 6 feet deep at mean low water, between Abbots Point and the town landing; also, to round off the angle in the channel at the point opposite Abbots Point to a depth of 6 feet at mean low water, the contract price being 38 cents per cubic yard, measured in scows. The amount of material excavated thus far is 18,651 cubic yards. In addition, 329 tons of bowlders have been removed from the channel opposite Abbots Point.

By chapter 138, Resolves of 1909, the Board was directed to complete the improvement of this harbor, and authorized to expend for that purpose \$10,000.

On July 2, 1909, a contract was entered into with John H. Gerrish to widen the channel at the entrance to the harbor 50

feet, thus making the entrance 100 feet wide for a distance of about 650 feet; to extend the anchorage basin east of Abbotts Point towards the public landing; to dredge an anchorage basin on the southerly side of the channel and east of Chapoquoit Island, all to a depth of 6 feet at mean low water, the contract price being as follows: for dredging the entrance channel, 38 cents per cubic yard, measured in scows; for dredging the anchorage basins, 30 cents per cubic yard, measured in scows.

The amount of material excavated is 9,500 cubic yards.

It is expected that all work under the two contracts will be completed before the yachting season of 1910.

Appropriations: —

Chapter 31, Resolves of 1906,	\$500
Chapter 512, Acts of 1907,	5,000
Chapter 112, Resolves of 1908,	10,000
Chapter 138, Resolves of 1909,	10,000
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Total,	\$25,500

The amount expended during the year is \$10,295.04.

The total amount expended to Dec. 1, 1909, is \$15,606.66.

WEYMOUTH FORE RIVER.

This river has been improved by the Commonwealth, beginning in the year 1903 by excavating a channel 200 feet wide and 15 feet deep at mean low water, extending from Quincy Point bridge down stream about 1,850 feet. This work was completed in 1904.

By chapter 103, Resolves of 1905, the Commonwealth accepted and agreed to observe the conditions contained in the river and harbor act of Congress, approved March 3, 1905, appropriating \$57,500 for dredging below the Quincy Point bridge, to the effect that the Commonwealth or other agency should assume the maintenance of the improvements made by the United States government in this river above Quincy Point and the improvement made in Town River, without further expense to the United States other than the sums already provided.

In 1908, in accordance with the provisions of the resolve of 1905 aforesaid, the Commonwealth dredged to 6 feet at mean

low water three different areas covering shoal portions in the upper part of the river, opposite Richards coal wharf, and extending easterly and southwesterly from Braintree bridge, the excavations being made 50 feet in width on the bottom.

By chapter 133, Resolves of 1909, the commissioners were directed to dredge the shoals in the upper part of the river in the channel excavated by the United States government. The appropriation was \$10,000. This work has not yet been contracted for.

Appropriations: —

Chapter 440, Acts of 1903,	\$25,000
Chapter 126, Resolves of 1908,	2,500
Chapter 133, Resolves of 1909,	10,000
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Total,	\$37,500

The amount expended during the year is \$2,339.20.

The total amount expended to Dec. 1, 1909, is \$14,065.04.

WITCHMERE HARBOR.

On Dec. 14, 1908, a contract was entered into with Thomas & Connor of Middleborough, Mass., for furnishing and placing stone riprap for protective purposes on the banks of the entrance channel of this harbor located in the town of Harwich, the contract price being \$2.15 per ton.

This work was completed April 12, 1909, at a total cost, including supervision and incidental expenses, of \$2,857, the whole length of the easterly bank and about two-thirds of the westerly bank having been protected by the placing of 1,241 tons of stone. The remaining portion of the westerly bank is low, and is not likely to be washed down and thus shoal the channel.

To prevent the sea from washing away the beach at the inner end of the easterly timber jetty and causing injury to the entrance channel, the fishermen and others living in the vicinity have co-operated in extending this jetty into the bank, without expense to the Commonwealth.

Unless it is found desirable to increase the depth of the entrance by dredging, it is not probable that any further expendi-

ture will be required at this harbor for some years, unless the erosion of the beach by the sea to the east of the entrance continues, in which case it may be necessary to protect it and prevent the sea from breaking through into the harbor.

Appropriations: —

Chapter 96, Resolves of 1899 (including East Bay and Lewis Bay),	\$1,500
Chapter 91, Resolves of 1904,	3,500
Chapter 441, Acts of 1906,	10,000
By the town of Harwich,	500
Chapter 119, Resolves of 1908,	3,000
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Total,	\$18,500

The amount expended during the year is \$2,857.

The total amount expended to Dec. 1, 1909, is \$22,622.02, of which a portion was paid from the appropriation for the survey and improvement of harbors.

WOLLASTON BEACH, QUINCY.

By chapter 37, Resolves of 1909, the Board was authorized and directed to deepen and enlarge the channel dredged at Wollaston beach in Quincy in accordance with the provisions of chapter 366, Acts of 1903, so that it shall be not less than 60 feet wide at the bottom and not less than 3 feet deep at mean low water, and to expend therefor \$7,500 as authorized by chapter 108, Resolves of 1908.

On April 23, 1909, a contract was entered into with the Bay State Dredging Company to dredge this channel 60 feet wide at the bottom and 3 feet deep at mean low water, the contract price being 37¼ cents per cubic yard, measured in scows. All work covered by the contract was completed June 10, 1909, additional dredging in excess of the original estimate also having been done to an average depth of about 4.5 feet at mean low water at and near the Wollaston Yacht Club House and the Squantum Yacht Club House, and in other localities. The excavation amounted to 18,916 cubic yards, and the total cost of the work, including supervision and incidental expenses, was \$7,308.86.

Appropriations: —

Chapter 366, Acts of 1903,	\$7,500
Chapter 108, Resolves of 1908,	7,500
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Total,	\$15,000

The amount expended during the year is \$7,308.86.

The total amount expended to Dec. 1, 1909, is \$14,644.61.

WRECKS AND OBSTRUCTIONS.

In the opinion of the Board, an amendment of chapter 595, Acts of 1908, relative to the breaking up and disposal of old vessels and other floating structures, is desirable, and legislation necessary therefor is recommended.

There should be a penalty provided to punish persons who shall, without license of the Board, beach old vessels in harbors, rivers or on flats, and then abandon them.

There has been no expenditure during the year from the appropriation of \$500 made by chapter 30, Acts of 1909, for the removal of wrecks and other obstructions from tide water.

SALE AND DISPOSITION OF MASSACHUSETTS ATLAS SHEETS AND TOWN BOUNDARY ATLASES.

Under authority of chapter 57, Resolves of 1890, chapter 42, Resolves of 1891, and chapter 360, Acts of 1900, atlas sheets of the map of the Commonwealth and town boundary atlases have been sold during the year, for which \$373.50 was received. Under the provisions of chapter 26, Resolves of 1909, there has been expended from this amount \$184.50 for the purchase from the United States Geological Survey of sheets required to keep in stock at all times copies of all the atlas sheets, leaving a balance of \$189, which has been forwarded to the Treasurer and Receiver-General, as required by the resolve.

Chapter 360, Acts of 1900, as amended by chapter 484 of the Acts of 1909, directed this Board to make certain disposition of the atlases of the boundary lines of the various cities and towns in the Commonwealth. Under this authority 144 atlases have been distributed during the year.

LICENSES GRANTED DURING THE YEAR.

Nos.

3336. Petition of the Staples Coal Company for license to strengthen a sea wall on Taunton River, in Taunton. Granted Dec. 2, 1908.
3337. Petition of Wilfred A. Tillson for license to excavate a channel and build a flume in Sampsons Pond, in Carver. Granted Dec. 4, 1908.
3338. Petition of James A. Baekus for license to build a pile wharf in Nantucket harbor, in Nantucket. Granted Dec. 14, 1908.
3339. Petition of Elizabeth T. Roberts for license to fill solid and to dredge in Deacons Pond, in Falmouth. Granted Dec. 14, 1908.
3340. Petition of Henrietta F. Goodnow for license to fill solid and to dredge in Deacons Pond, in Falmouth. Granted Dec. 14, 1908.
3341. Petition of Eugene E. C. Swift for license to build sea walls and fill solid in Deacons Pond, in Falmouth. Granted Dec. 30, 1908.
3342. Petition of Edmund D. Codman and Joseph B. Russell, trustees of Lovejoy's Wharf Trust, for license to build a bulkhead and fill solid on Charles River, in Boston. Granted Jan. 6, 1909.
3343. Petition of the South Boston Yacht Club for license to drive piles for the support of cleaning blocks for yachts, in Dorchester Bay, at South Boston. Granted Jan. 27, 1909.
3344. Petition of Edward S. Groves for license to build a timber break-water in Hull Bay, in Hull. Granted Jan. 29, 1909.
3345. Petition of John D. Silva for license to build timber bulkheads and a marine railway, and to fill solid, in Provincetown harbor, in Provincetown. Granted Jan. 29, 1909.
3346. Petition of John Oliver for license to build a pile wharf and marine railway in Provincetown harbor, in Provincetown. Granted Jan. 29, 1909.
3347. Petition of John P. Woodbury for license to build a bulkhead and fill solid in Lynn harbor, in Lynn. Granted Feb. 5, 1909.
3348. Petition of Eben S. Lord for license to locate and maintain a float stage in Salem harbor, in Salem. Granted Feb. 5, 1909.
3349. Petition of the Merrimac Hat Company for license to fill solid in Merrimac River, in Amesbury. Granted Feb. 15, 1909.
3350. Petition of Daniel S. Tarr, George I. Tarr and Henry A. Tarr for license to locate and maintain a floating landing and a runway in Gloucester harbor at Pavilion beach, in Gloucester. Granted March 3, 1909.
3351. Petition of Charles Albion Clark and Dora Clark Harris, heirs of Charles S. Clark, for license to build a bulkhead and pile platform, and to fill solid on South River, in Salem. Granted March 5, 1909.

Nos.

3352. Petition of the city of Boston for license to build a pier and wharf, on piles, in Boston harbor at the South Ferry, in East Boston. Granted March 8, 1909.
3353. Petition of the Mount Carmel Cranberry Company for license to excavate and construct an inlet and flume, at Bates Pond, in Carver. Granted March 10, 1909.
3354. Petition of the city of Springfield for approval of plans for laying two lines of 36-inch water pipe under and across Connecticut River, in Springfield and West Springfield, under authority of chapter 317, Acts of 1906. Granted March 19, 1909.
3355. Petition of D. Blakely Hoar and William H. Dunbar, trustees, for license to maintain filling in Crystal Cove southerly of Washington Avenue, in Winthrop. Granted March 19, 1909.
3356. Petition of the county commissioners of Essex County, for approval of plans for reconstructing, with suitable approaches, the Chain bridge over Merrimac River, in Newburyport and Amesbury, under authority of chapter 640, Acts of 1908. Granted March 24, 1909.
3357. Petition of Samuel D. Hildreth and Walter F. Osborne, trustees of the Twenty Associates, for license to build a sea wall and fill solid in Gloucester harbor, in Gloucester. Granted March 24, 1909.
3358. Petition of the United Cape Cod Cranberry Company for license to excavate an inlet and canal, drive piles, and construct a concrete flume and pump well in Stetson Pond, in Pembroke. Granted April 2, 1909.
3359. Petition of the Metropolitan Water and Sewerage Board for approval of plans for an addition to the East Boston pumping station on Chelsea Creek, at East Boston, under authority of chapter 439, Acts of 1889. Granted April 9, 1909.
3360. Petition of Abram Osborne for license to widen his wharf, on piles, in Edgartown harbor, in Edgartown. Granted April 12, 1909.
3361. Petition of the City Manufacturing Company for license to lay and maintain a 30-inch iron pipe and construct a pile well on Acushnet River, in New Bedford. Granted April 21, 1909.
3362. Petition of Alvarado A. Coburn for license to locate and maintain a floating landing in Lake Quinsigamond, in Worcester. Granted April 21, 1909.
3363. Petition of Austin Gove & Son, Inc., for license to rebuild, widen and extend, on piles, a portion of a wharf in Boston harbor, at East Boston. Granted April 21, 1909.
3364. Petition of the Point Independence Yacht Club for license to build and maintain a wharf in Onset Bay, in Wareham. Granted April 21, 1909.

Nos.

3365. Petition of the Boston & Albany Railroad, the New York Central & Hudson River Railroad Company, lessee, for license to rebuild and extend, on piles, its two piers easterly of Cunard pier in Boston harbor, at East Boston. Granted April 26, 1909.
3366. Petition of the city of Boston for license to lay and maintain a 4-inch water pipe in Boston harbor from Long Island to Spectacle Island. Granted April 28, 1909.
3367. Petition of the Salem Electric Lighting Company for license to rebuild its sea wall on South River, in Salem. Granted May 3, 1909.
3368. Petition of Charles F. Lancaster and Alden A. Mills, trustees, for license to build two concrete retaining walls, fill solid and excavate material in Broad Sound and Saugus River, in Revere. Granted May 3, 1909.
3369. Petition of the Sagamore Manufacturing Company, James H. Wilson, and James H. Wilson, trustee, for license to build a retaining wall, construct an intake trench, lay a pipe and fill solid on Taunton River, in Fall River. Granted May 3, 1909.
3370. Petition of George Hayes & Co. for license to extend their wharf, on piles, on Chelsea Creek, at East Boston. Granted May 5, 1909.
3371. Petition of Alvin F. Waite for license to build and maintain a pile pier in Apponagansett harbor, in Dartmouth. Granted May 5, 1909.
3372. Petition of the Neponset Valley Yacht Club for license to relocate and maintain its pile pier and float stage on Neponset River, in Milton. Granted May 10, 1909.
3373. Petition of Edmund D. Codman and Joseph B. Russell, trustees of Lovejoy's Wharf Trust, for license to build a pile wharf and to rebuild, on piles, two existing pile wharves on Charles River, in Boston. Granted May 24, 1909.
3374. Petition of the Naumkeag Steam Cotton Company for license to build a sea wall and fill solid on South River, in Salem. Granted May 24, 1909.
3375. Petition of the city of Boston for approval of plans for the construction and maintenance of a float and protective pile structures near Northern Avenue bridge on Fort Point Channel, in Boston, under authority of chapter 284, Acts of 1909. Granted June 2, 1909.
3376. Petition of the Staples Coal Company, lessee, for license to extend, on piles, wharves on Fort Point Channel, in Boston. Granted June 2, 1909.
3377. Petition of the city of Beverly for license to lay and maintain a 20-inch iron pipe in tide water from Andrews Court to Dane Street, in Beverly. Granted June 4, 1909.

Nos.

3378. Petition of the town of Falmouth for license to build two boat landings in Deacons Pond, in Falmouth. Granted June 4, 1909.
3379. Petition of Edward B. Hayward for license to build and maintain a pile pier and float stage in Buzzards Bay at Onset Island, in Wareham. Granted June 4, 1909.
3380. Petition of Andrew H. Bearse for license to build bulkheads and a marine railway in Stage Harbor, in Chatham. Granted June 4, 1909.
3381. Petition of J. Arthur Beebe for license to build a pile wharf on Vineyard Sound, in Falmouth. Granted June 7, 1909.
3382. Petition of the city of Boston for license to repair the draw landing of L Street bridge on the Reserved Channel, at South Boston. Granted June 7, 1909.
3383. Petition of the town of Wellfleet for license to build a bulkhead, culvert and tide gate, and fill solid, at Mayo's Beach bridge, in Wellfleet. Granted June 7, 1909.
3384. Petition of Willard P. Griffin for license to build supports for a structure in Lobster Cove at Annisquam, in Gloucester. Granted June 21, 1909.
3385. Petition of James A. Backus, Arthur W. Jones and Fred D. Maglathlin for license to build a pile structure in Nantucket harbor, at Nantucket. Granted June 21, 1909.
3386. Petition of William C. Chandler and Albert L. Chandler for license to excavate and build a flume in Vaughan's Pond, in Carver. Granted June 21, 1909.
3387. Petition of the city of Boston for license to build a stone break-water in Boston harbor, at Deer Island. Granted June 25, 1909.
3388. Petition of Alice T. Herrick for license to build a dike across Bass Creek, in Wareham. Granted June 25, 1909.
3389. Petition of the Standard Oil Company of New York for license to build a pile wharf and pile dolphin in New Bedford harbor near Fish Island, in New Bedford. Granted June 25, 1909.
3390. Petition of Edward J. Ball for license to construct concrete piers for the support of a building in Hull Bay near Allerton station, in Hull. Granted July 9, 1909.
3391. Petition of the Kehew-Bradley Company for license to drive piles and strengthen its sea wall and wharf on South River, in Salem. Granted July 9, 1909.
3392. Petition of the Holmes Manufacturing Company for license to lay and maintain a 24-inch iron pipe and construct a pile and timber intake well in New Bedford harbor, in New Bedford. Granted July 9, 1909.
3393. Petition of William T. Swain & Co. for license to build a bulkhead and marine railway, and to fill solid in Nantucket harbor, in Nantucket. Granted July 9, 1909.

Nos.

3394. Petition of the Boston & Albany Railroad, the New York Central & Hudson River Railroad Company, lessee, for license to build pile and timber structures and to dredge in its docks Nos. 4 and 5 in Boston harbor, at East Boston. Granted July 19, 1909.
3395. Petition of Albert F. Bigelow for license to build a concrete bridge and approaches between White Head, Little White Head and the mainland, in Cohasset. Granted July 21, 1909.
3396. Petition of the Heywood Brothers & Wakefield Company for license to fill solid and maintain filling done in Little Lake, formerly a portion of Crystal Lake, in Gardner. Granted July 23, 1909.
3397. Petition of the Taunton Gas Light Company for license to lay and maintain two 3-inch gas pipes in Taunton River, in Taunton. Granted July 26, 1909.
3398. Petition of the People's Coal Company for license to build a sea wall, fill solid, drive piles, build two pile dolphins and to dredge on Taunton River, in Fall River. Granted July 26, 1909.
3399. Petition of the Boston & Maine Railroad for license to drive piles at Mystic wharf on the south channel of Mystic River, in Boston. Granted July 28, 1909.
3400. Petition of Walter Cushing for license to excavate a canal in Island Creek Pond, in Duxbury. Granted July 28, 1909.
3401. Petition of John B. Hadaway for license to excavate a canal in Island Creek Pond, in Duxbury. Granted July 28, 1909.
3402. Petition of the Lockwood Manufacturing Company for license to extend its marine railway, on piles, in Boston harbor, at East Boston. Granted July 30, 1909.
3403. Petition of the Holbrook, Cabot & Rollins Corporation for license to build a pile wharf in Dorchester Bay, in Quincy. Granted Aug. 6, 1909.
3404. Petition of the Connecticut River Transmission Company for license to erect a steel tower and string wires in and over Crystal Lake, in Gardner. Granted Sept. 8, 1909.
3405. Petition of the Point Shirley Yacht Club for license to build a pile pier in Boston harbor at Point Shirley, in Winthrop. Granted Sept. 10, 1909.
3406. Petition of the city of Boston for license to rebuild, on piles, a portion of Granite bridge on Neponset River, in Boston. Granted Sept. 10, 1909.
3407. Petition of Fred A. Bruce for license to build a marine railway, on piles, in Belle Isle Inlet, in Revere. Granted Sept. 10, 1909.
3408. Petition of the Lynn Yacht Club for license to build a bulkhead, fill solid and locate and maintain floats in Lynn harbor, in Lynn. Granted Sept. 13, 1909.

Nos.

3409. Petition of the county commissioners of Essex County for license to rebuild, on piles, the fender pier of Groveland bridge on Merrimac River, in Haverhill and Groveland. Granted Oct. 1, 1909.
3410. Petition of the Fall River Electric Light Company for license to lay and maintain a 3-inch cable in Taunton Great River, in Fall River and Somerset. Granted Oct. 1, 1909.
3411. Petition of Felecieen Proulx for license to build a sea wall and fill solid in Palmers Cove, in Salem. Granted Oct. 1, 1909.
3412. Petition of William C. Bray for license to build and maintain a wharf and landing stage in Onset Bay, in Wareham. Granted Oct. 11, 1909.
3413. Petition of Edward N. Fenno for license to build a pile pier in Nantucket Sound, in Falmouth. Granted Oct. 11, 1909.
3414. Petition of the People's Coal Company for license to build sea wall, fill solid and drive piles on Taunton River, in Fall River. Granted Oct. 13, 1909.
3415. Petition of the Sea Coast Oyster Company for license to build a pile wharf in Wellfleet harbor, in Wellfleet. Granted Oct. 20, 1909.
3416. Petition of the city of New Bedford for license to construct a reinforced concrete sewer in Acushnet River, in New Bedford. Granted Nov. 3, 1909.
3417. Petition of the city of Boston for license to dump snow and ice into tide waters. Granted Nov. 3, 1909.
3418. Petition of the Boston Elevated Railway Company for license to dump snow and ice into tide waters. Granted Nov. 3, 1909.

MISCELLANEOUS PERMITS GRANTED DURING THE YEAR.

- JOHN F. COYLE, to dump on the Commonwealth flats, at South Boston, material taken in the city of Boston. Granted Dec. 2, 1908.
- THE GARFIELD & PROCTOR COAL COMPANY, to dredge a berth in Acushnet River, in New Bedford. Granted Dec. 9, 1908.
- JAMES MULLIGAN, to dump on the Commonwealth flats, at South Boston, material taken in the city of Boston. Granted Dec. 16, 1908.
- ELLEN M. BOARDMAN, to remove gravel from Salter's beach, in Plymouth. Granted Jan. 8, 1909.
- HERBERT L. ANDREWS and E. U. IWWERKS, to use and occupy a part of Berry Island in Lake Winthrop, in Holliston. Granted Jan. 15, 1909.
- JEREMIAH P. O'RIORDEN, to dredge material from Weymouth Back River, in Hingham. Granted March 5, 1909.
- MILTON DA COSTA, to use and occupy Quarantine Rock, in Boston harbor. Granted March 6, 1909.

- JEREMIAH P. O'RIORDEN, to excavate a basin and dredge a channel in Boston harbor, in Boston. Granted March 10, 1909.
- MARY F. MAHLER, to extend a supply pipe to the shore of Bates Pond, in Carver. Granted March 10, 1909.
- JOSEPH GAHM & SON, to dump ashes on the Commonwealth flats, at South Boston. Granted March 24, 1909.
- THE NEW BEDFORD GAS and EDISON LIGHT COMPANY, to dredge in Acushnet River, at New Bedford. Granted March 31, 1909.
- BAY STATE DREDGING COMPANY, to dredge material in Boston harbor at Point Shirley, in Winthrop. Granted March 31, 1909.
- CITY OF BOSTON, to lay a 30-inch water pipe in C Street, Congress Street, and C Street extended and Northern Avenue, at South Boston. Granted March 31, 1909.
- BAY STATE DREDGING COMPANY, to dredge material from Shirley Gut, in Boston harbor. Granted April 2, 1909.
- EASTERN DREDGING COMPANY, to dredge material from Shirley Gut, in Boston harbor. Granted April 7, 1909.
- SPENCER F. WILLIAMS and CHARLOTTE FAIRFIELD, to dredge in South River, in Salem. Granted April 23, 1909.
- E. S. BALDWIN COMPANY, to dredge in South River, in Salem. Granted April 23, 1909.
- BETTS BROTHERS & Co., to dredge material from Shirley Gut, in Boston harbor. Granted April 23, 1909.
- W. H. WYMAN, to remove an old barge from Boston harbor, and to break up and burn the same at Apple Island. Granted April 26, 1909.
- TOWN OF MANCHESTER, to dredge a portion of the channel in Manchester harbor. Granted April 28, 1909.
- TOWN OF PLYMOUTH, to dredge in Plymouth harbor. Granted May 3, 1909.
- BAY STATE DREDGING COMPANY, to dredge material from Shirley Gut, in Boston harbor. Granted May 5, 1909.
- DAVID FENTON COMPANY, to dredge in Manchester harbor. Granted May 5, 1909.
- TOWN OF MANCHESTER, to dredge in Manchester harbor. Granted May 7, 1909.
- JAMES S. SWEENEY, to dump ashes on the Commonwealth flats, at South Boston. Granted May 7, 1909.
- P. O'RIORDEN DREDGING COMPANY, to dredge material in Chelsea Creek, in Chelsea. Granted May 7, 1909.
- CITY OF HAVERHILL, ordinance regulating the passage of vessels through the draw of the Haverhill bridge on Merrimac River. Approved May 14, 1909.
- SAVIN HILL YACHT CLUB, to dredge a basin in Dorchester Bay. Granted May 21, 1909.

- R. S. BRINE TRANSPORTATION COMPANY, to dump ashes on the Commonwealth flats, at South Boston. Granted May 26, 1909.
- E. S. BALDWIN COMPANY, to dredge in South River, in Salem. Granted June 2, 1909.
- GEORGE G. CROCKER, ALVIN F. SORTWELL and FREDERIC D. FISK, trustees of the Main Street Land Trust, to dredge material from their flats in Charles River on the Cambridge side of the channel, near Cambridge bridge. Granted June 7, 1909.
- BAY STATE DREDGING COMPANY, to dredge in Boston harbor, adjoining the 35-foot channel and easterly of Deer Island. Granted June 7, 1909.
- BEVERLY GAS AND ELECTRIC COMPANY, to dredge in Beverly harbor, in Beverly. Granted June 11, 1909.
- HOLMES MANUFACTURING COMPANY, to dredge a channel in New Bedford harbor at Clark's Point, in New Bedford. Granted June 14, 1909.
- JOSEPH MIDDLEBY, Jr., Inc., to dump ashes on the Commonwealth flats, at South Boston. Granted June 14, 1909.
- JOHN R. BURKE, to dredge in Deacons Pond, in Falmouth. Granted June 14, 1909.
- EASTERN DREDGING COMPANY, to dredge material from Broad Sound, in Boston harbor. Granted June 14, 1909.
- BAY STATE DREDGING COMPANY, to dredge material from Charles River above North Beacon Street bridge. Granted June 14, 1909.
- FRANK J. HANNON, to dump ashes on the Commonwealth flats, at South Boston. Granted June 16, 1909.
- NANTASKET BEACH STEAMBOAT COMPANY, to remove accumulations of sand in the berths and around Pemberton pier, in Hull. Granted June 25, 1909.
- NEW BEDFORD, MARTHAS VINEYARD & NANTUCKET STEAMBOAT COMPANY, to remove portion of old wharf from Vineyard Sound, at Falmouth. Granted June 30, 1909.
- MESSRS. GREENE & WOOD and ALBERT W. HOLMES, to dredge a channel in New Bedford harbor, in New Bedford. Granted June 28, 1909.
- FIRST WORLD'S SHOE AND LEATHER FAIR COMPANY, to locate a float and runway in Charles River basin, in Cambridge. Granted June 30, 1909.
- THOMAS BUTLER & Co., to moor the steamer "Dean Richmond" east of the Commonwealth pier, for the purpose of removing the machinery therefrom. Granted July 9, 1909.
- MASSACHUSETTS STEEL CASTING COMPANY, to dredge in Malden River, in Everett. Granted July 9, 1909.
- TOWN OF PLYMOUTH, to dredge in Plymouth harbor. Granted July 13, 1909.
- BETHEL BEACH REAL ESTATE TRUST, to dump sand on Bethel beach, in Quincy, near Rock Island Cove. Granted July 19, 1909.

FORE RIVER SHIPBUILDING COMPANY, to dredge in Weymouth Fore River, in Quincy. Granted July 21, 1909.

ROWE BROTHERS COMPANY, to dredge sand in Ipswich River. Granted July 23, 1909.

METROPOLITAN COAL COMPANY, to dump ashes on the Commonwealth flats, at South Boston. Granted July 23, 1909.

STAPLES COAL COMPANY, to dump ashes on the Commonwealth flats, at South Boston. Granted July 23, 1909.

J. B. WOODFORD, to remove sand and gravel from the beach at North Scituate. Granted July 26, 1909.

P. E. SAVILLE, to remove small stones from the beach at Point Shirley, in Winthrop. Granted July 26, 1909.

JOHN R. BURKE, to dredge in Woods Hole Great Harbor, in Falmouth. Granted July 26, 1909.

JOHN R. BURKE, to dredge in East Bay, at Osterville. Granted July 28, 1909.

WILLIAM L. MILLER, to use for storage purposes a portion of the Commonwealth pier, at South Boston. Granted July 28, 1909.

J. P. O'RIORDEN, to dredge sand in Ipswich River. Granted July 28, 1909.

BOSTON, CAPE COD AND NEW YORK CANAL COMPANY, to dump material in Buzzards Bay, westerly of West Falmouth harbor. Granted July 30, 1909.

CITY OF HAVERHILL, to dredge a berth in Merrimac River. Granted Aug. 6, 1909.

HAVERHILL BOX BOARD COMPANY, to dredge a berth in Merrimac River, at Haverhill. Granted Aug. 6, 1909.

JOHN O. ELLISON, to dredge a berth in Merrimac River, at Haverhill. Granted Aug. 6, 1909.

WILLIAM L. MILLER, to use for storage purposes a portion of the Commonwealth pier, at South Boston. Granted Sept. 1, 1909.

SAVIN HILL YACHT CLUB, to dredge in Dorchester Bay, at Savin Hill. Granted Sept. 13, 1909.

THOMAS BUTLER & Co., to remove from tide water the hull of the steamer "Dean Richmond," and to break up and burn the same on the shore of Weymouth Fore River. Granted Sept. 24, 1909.

J. P. O'RIORDEN, to dump on the Commonwealth flats, at South Boston, material taken in the city of Boston. Granted Sept. 24, 1909.

METROPOLITAN PARK COMMISSION, to change a portion of the northerly shore line of Charles River, at Watertown. Granted Oct. 1, 1909.

BOSTON, CAPE COD AND NEW YORK CANAL COMPANY, to dump material at the Cape Cod Bay terminus of the Cape Cod Canal, and in Cape Cod Bay. Granted Oct. 1, 1909.

WILLIAM L. MILLER, to use for storage purposes a portion of the Commonwealth pier, at South Boston. Granted Oct. 6, 1909.

THE JOHN T. SCULLY FOUNDATION AND TRANSPORTATION COMPANY, to use for storage purposes a portion of the Commonwealth's land, at South Boston. Granted Oct. 13, 1909.

JOHN H. LETTENEX, to dump material dredged from private docks in the city of Gloucester. Granted Oct. 20, 1909.

WILLIAM A. PAINE, to remove sand from Phillips beach, in Swampscott. Granted Oct. 20, 1909.

J. P. O'RIORDEN, to dredge sand from Cape Cod Bay, between Race Point and Wood End. Granted Oct. 22, 1909.

J. P. O'RIORDEN, to dredge material in Boston harbor, between Gallop's Island and Nix's Mate. Granted Oct. 22, 1909.

BOSTON ELEVATED RAILWAY COMPANY, to dump snow and ice on the Commonwealth flats, at South Boston. Granted Nov. 3, 1909.

FORE RIVER SHIPBUILDING COMPANY, to dredge a berth in Weymouth Fore River, in Quincy. Granted Nov. 3, 1909.

SOLEY & BLAIR, to dump snow from Dover Street bridge into tide water, in Boston. Granted Nov. 24, 1909.

WORK OF THE UNITED STATES IN RIVERS AND HARBORS OF THE COMMONWEALTH.

The Board is indebted to Lieut.-Col. Edward Burr, Corps of Engineers, U. S. A., who is in charge of river and harbor improvements in eastern Massachusetts, and Lieut.-Col. J. C. Sanford, Corps of Engineers, U. S. A., who is in charge of similar work in southern Massachusetts, for the following statements, which show the work accomplished in the rivers and harbors of the Commonwealth during the fiscal year ending June 30, 1909:—

STATEMENT OF LIEUT.-COL. EDWARD BURR, CORPS OF ENGINEERS. U.S.A.

BOSTON, MASS., NOV. 17, 1909.

Board of Harbor and Land Commissioners, Commonwealth of Massachusetts, State House, Boston, Mass.

SIRS:—In accordance with your request of the 3d inst., I have the honor to furnish the following summary of work accomplished by the United States during the fiscal year ending June 30, 1909, upon the improvement of rivers and harbors in Massachusetts under the charge of this office.

Newburyport Harbor.

Eleven thousand, nine hundred and sixty-one tons of rubblestone were deposited in the north jetty, extending the jetty seaward about 55 feet.

Merrimac River.

Late in June, 1909, removal of bowlders was commenced, and was in operation at the close of the fiscal year.

Essex River.

Ten thousand, three hundred and fifty-five cubic yards of material were dredged from the channel, and dredging was in progress at the close of the fiscal year.

Harbor of Refuge, Sandy Bay, Cape Ann.

Eighty-three thousand, three hundred and eighty-two tons of rubble-stone were deposited in the western arm of the breakwater, in extension of the substructure, and 97 linear feet of superstructure was constructed on the southern arm of the breakwater, extending in a northerly direction from a point about 200 feet south of the angle of intersection of the two arms.

Gloucester Harbor.

Minor repairs were made to the superstructure of the Dog Bar breakwater.

Beverly Harbor.

A contract was entered into for removal of ledges obstructing the dredged channel. No work had been done under this contract to the close of the fiscal year.

Malden River.

Four thousand, eight hundred and fifty-seven cubic yards of material were dredged in removing shoals from the upper part of the dredged channel.

Boston Harbor.

Thirty-five Foot Channel.—Under this project, 2,556,095 cubic yards of material were dredged from the channel between President Roads and the Navy Yard, Chelsea and Charles River bridges; and 852,355 cubic yards from the channel in Broad Sound, from President Roads to the sea.

A contract dated April 26, 1905, for excavating, to a depth of 35 feet at mean low water, 16,555 cubic yards of rock from the inner main ship channel, was completed; and drilling and blasting was in progress throughout the year, under another contract for excavating 15,195 cubic yards of rock from that channel.

Fort Point Channel.

Seventeen thousand, two hundred and sixty-two cubic yards of material were dredged in obtaining the full width and depth authorized, at the site of the Mount Washington Avenue bridge, recently removed.

Dorchester Bay and Neponset River.

Three hundred and one thousand, three hundred and six cubic yards of material were dredged, and the section of channel from Commercial Point to the Neponset highway bridge was completed, 100 feet wide and 15 feet deep at mean low water. At the close of the fiscal year dredging was in progress in the section through the mouth of the river and in Dorchester Bay, which is to be dredged 175 feet wide and 18 feet deep at mean low water.

Provincetown Harbor.

Minor repairs and extensions were made to the timber bulkheads in the vicinity of Abel Hill dike.

Removal of Wrecks.

The wreck of the steamer "City of Birmingham" was removed from the inner main ship channel of Boston harbor.

Very respectfully,

EDWARD BURR,

Lieutenant-Colonel, Corps of Engineers.

Statement of Lieut.-Col. J. C. Sanford, Corps of Engineers, U. S. A., showing the work done by the United States on the rivers and harbors of Massachusetts under the Newport, R. I., engineer office, during the fiscal year ending June 30, 1909:—

Hyannis Harbor.

No works of improvement were in progress during the fiscal year.

Nantucket Harbor.

No works of improvement have been in progress during the fiscal year. A survey of the jetty channel was made in June, 1909.

Vineyard Haven.

No works of improvement were in progress during the fiscal year.

Woods Hole Channel.

A small shoal spot in the eastern end of the main channel was blasted, and is believed to have been entirely removed. A new survey of the channel will be made.

New Bedford Harbor.

The work of dredging in progress at the close of the last fiscal year, under a continuing contract with the Coastwise Dredging Company of

Norfolk, Va., was continued throughout the year, except for the period from February 1 to March 11, when the dredge was withdrawn on account of stormy weather and ice. A second dredge was at work during nine months of the year. A total of 880,746 cubic yards of mud, sand and gravel and 446.733 cubic yards of bowlders exceeding one cubic yard each were removed, making a total under the contract of 2,079,659 cubic yards of mud, sand and gravel, and 450.4 cubic yards of large bowlders.

The project for this improvement contemplates dredging channels 25 feet deep at mean low water 300 feet wide from Buzzards Bay to the north end of Fish Island, just above the New Bedford and Fairhaven bridge, with a turning basin above the bridge and an anchorage area of about 114 acres, 25 feet deep, between New Bedford and Fairhaven, at an estimated cost of \$527,000. Of this sum, \$300,000 has been appropriated. Section 3 of the river and harbor act, approved March 3, 1909, authorized a slight modification of the original project, as follows:—

Improving harbors of New Bedford and Fairhaven, Massachusetts: The authorization for the improvement of said harbors contained in the river and harbor act of March 2nd nineteen hundred and seven is hereby extended so as to include the extension of the basin north of Fish Island now being dredged under the adopted project, southward between the harbor lines to the bridge between New Bedford and Fish Island, and the extension of the twenty-five foot channel along the New Bedford front from its terminus, as contemplated by the present project, northerly between established harbor lines to said bridge: *Provided*, that a contract or contracts can be made for such improvement within the limit of cost authorized by the said act of March second, nineteen hundred and seven.

Taunton River.

Work under a contract with the J. S. Packard Dredging Company of Providence, R. I., for dredging a shoal near the lower end of Weir Village, was commenced Aug. 5 and completed Sept. 8, 1908. The dredge removed 4,270 cubic yards of sand, gravel and mud, and spent forty-one hours in the removal of bowlders from "Burt's Turn," just above North Dighton.

Removal of Wrecks.

The following wrecks were removed so as to no longer form obstructions to navigation, or reported for removal:—

Schooner "Harry Messer," a three-masted wooden schooner, sunk on the northeast part of Handkerchief Shoal.

Steamer "Horatio Hall," sunk in collision in Pollock Rip Slue, eastern entrance to Nantucket Sound, March 10, 1909.

Schooner "Jennie French Potter," a five-masted wooden schooner, sunk on "Half Moon" shoal at the eastern end of Horse Shoe Shoal,

about $1\frac{3}{4}$ miles northeast of Cross Rip Light Vessel, Nantucket Sound. Reported for removal June 28, 1909.

Preliminary examinations and surveys were authorized by the river and harbor act of March 3, 1909, at the following locations in this district:—

Little Harbor Woods Hole; Fall River harbor; Nantucket Sound, with a view to the removal of the northerly portions of Stone Horse Shoal and of such portions of Bearse's Shoal and Pollock Rip Shoal as may be necessary.

Reports upon the preliminary examination of Little Harbor Woods Hole and Fall River were submitted, reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and surveys of both localities were ordered, that of Little Harbor Woods Hole having been completed.

APPROPRIATION FOR SURVEY AND IMPROVEMENT OF HARBORS.

By chapter 30 of the Acts of 1909, an appropriation of \$4,000 was made for surveys of harbors and for improving and preserving the same, and for repairing damages occasioned by storms along the coast line or river banks of the Commonwealth.

Expenditures from this appropriation have been made to Dec. 1, 1909, in the localities and to the amounts following, viz.:—

Annisquam River and Lobster Cove,	\$111 74
Bass River, Yarmouth,	156 35
Chatham riprap,	20 47
Connecticut River, Hadley,	515 30
Connecticut River, Northampton,	25 80
Connecticut River, Mt. Tom Junction,	954 06
Cotuit harbor,	486 78
East Bay, Osterville,	36 57
Harbor View,	146 00
Herring River, Harwich,	88 18
Lynn harbor,	146 00
Rock harbor,	11 60
Sesuit harbor,	57 95
Vineyard Haven harbor,	16 62
West Bay, Osterville,	51 28
West Falmouth harbor,	44 17
Winthrop harbor,	106 33
Total,	\$2,975 20

COMMONWEALTH'S FLATS IMPROVEMENT FUND.

The balance in the Commonwealth's flats improvement fund on the first day of December, 1908, was \$1,070,446.44. To this has been added during the year \$40,999.62 from the income of the fund and \$33,106.67 from sales, rents of lands and other sources, making a total of \$1,144,552.73. Of this sum there has been expended during the year \$61,397.83, leaving a balance on Nov. 30, 1909, of \$1,083,154.90. Of this balance \$497,872.30 has been appropriated for the completion of the anchorage basin under chapter 476 of the Acts of 1901, and \$381,671.03 for the further improvement of the Commonwealth's flats at South Boston.

HARBOR COMPENSATION FUND.

There was paid into the treasury of the Commonwealth during the year, under chapter 146 of the Acts of 1897 and chapter 96 of the Revised Laws, for tide water displaced by work done under licenses granted by the Board, and for rights and privileges granted in tide waters and great ponds, the sum of \$9,357.38, which was credited to the harbor compensation fund for Boston harbor. The amount in this fund on Nov. 30, 1909, was \$599,371.60; the balance of income from this fund in the treasury on the same date was \$17,576.45; the total income for the year was \$23,362.66. The expenditure for dredging during the year, from the income, was \$9,477.64.

The foregoing report is respectfully submitted.

GEORGE E. SMITH,
SAMUEL M. MANFIELD,
HEMAN A. HARDING,

Commissioners.

APPENDIX.

APPENDIX A.

APPROPRIATIONS BY THE LEGISLATURE AND EXPENDITURES FOR RIVER AND HARBOR WORK UNDER DIRECTION OF THE HARBOR AND LAND COMMISSIONERS.

Small Harbors.—From 1893 to 1909 inclusive.

LOCALITY.	Character of Work.	Total Appropriation.	Total Expenditure.	Approximate Balance required to complete Contract.
Allen's harbor, . . .	Survey, . . .	\$219 50	\$219 50	-
Annisquam River and Lobster Cove.	Dredging, . . .	66,881 15	65,707 19	\$980 00
Apponagansett harbor, .	Stone breakwater, .	40,500 00	40,221 33	-
Barnstable harbor, . . .	Survey, . . .	217 51	217 51	-
Bass River, Beverly, . .	Dredging, . . .	25,000 00	25,539 81	-
Bass River, Yarmouth, .	Jetties and dredging,	47,500 00	42,271 10	5,000 00
Buck's Creek, ¹ Chatham, .	Jetty and survey, . .	1,250 00	1,190 35	-
Cataumet harbor, . . .	Survey, . . .	500 00	356 33	-
Chatham,	Stone riprap, . . .	15,000 00	12,724 41	2,100 00
Cotuit harbor,	- - -	20,000 00	2,647 45	-
Cuttyhunk harbor, . . .	Jetties and dredging,	31,000 00 ²	15,201 95	15,600 00
Deacon's Pond, Falmouth,	Jetties and dredging,	25,000 00 ³	35,007 00	-
Dorchester, easterly shore,	Dredging,	70,000 00	70,171 31	-
East Bay, Osterville, . .	Jetties and dredging,	16,938 39	18,874 58	-
Essex River,	Dredging,	5,000 00	5,000 00	-
Green harbor,	Jetties and dredging,	90,500 00	76,333 26	-
Harbor View,	Dredging,	10,000 00	146 00	-
Herring River, Harwich, .	Jetties and dredging,	20,500 00 ⁴	12,628 40	9,000 00
Herring River, Wellfleet, .	Dike and ditches, . .	10,000 00 ⁵	15,329 23	2,780 00
Hingham harbor,	Dredging,	10,000 00 ⁶	13 74	-
Humarock beach, Scituate,	Survey,	250 00	236 07	-
Ipswich River,	Dredging,	11,000 00	11,188 56	-
Island End River,	Survey,	264 10	264 10	-
Jeffries Point,	Dredging,	10,000 00	-	-
Lake Anthony, Oak Bluffs,	Jetties and dredging,	35,000 00	36,184 84	-
Lewis Bay, Hyannis, . . .	Dredging,	16,477 21	17,012 22	-
Lynn harbor,	Dredging and survey,	11,000 00	149 90	9,500 00

¹ Or Red River.

² \$5,000 additional by town of Gosnold.

³ \$10,000 additional by town of Falmouth.

⁴ \$2,000 additional by town of Harwich.

⁵ \$10,000 additional by town of Wellfleet.

⁶ \$3,000 additional by town of Hingham.

Small Harbors, etc. — Continued.

LOCALITY.	Character of Work.	Total Appropriation.	Total Expenditure.	Approximate Balance required to complete Contract.
Manchester harbor, . .	Dredging, . .	\$8,000 00 ¹	\$8,128 58	-
Menamsha Inlet, . .	Jetties and dredging,	44,000 00	45,673 30	-
Merrimac River, . .	Investigation, . .	100 00	-	-
Nantucket harbor, . .	Dredging, . .	15,000 00	15,930 30	-
Neponset River, . .	Dredging, . .	34,270 44	-	-
North River, Scituate, .	Survey, . .	119 70	552 47	-
Oak Bluffs, public landing,	Removing rocks, .	500 00	462 50	-
Orient Heights, . .	Dredging, . .	8,500 00	5,336 52	\$2,800 00
Paskamansett River, .	Dredging, . .	2,000 00	2,092 15	-
Penikese Island, . .	Pile wharf and survey,	5,300 00	3,561 95	-
Plum Island River, . .	Survey, . .	983 31	983 31	-
Plymouth harbor, . .	Dredging, . .	80,400 00 ²	70,808 28	49,000 00
Province Lands, . .	Reclamation, . .	58,000 00	50,278 16	-
Quansett harbor, . .	Survey, . .	195 88	194 50	-
Quicks Hole, . .	Survey, . .	500 00	-	-
Revere, . .	Stone breakwater, .	55,000 00	54,990 84	-
Rock harbor, Orleans, .	Dredging, . .	5,200 00	5,196 06	-
Rockport harbor, . .	Removing rocks, .	8,000 00	7,319 70	-
Saugus River, . .	Survey, . .	1,000 00	638 53	-
Scituate, . .	Sea walls and riprap,	38,300 00	36,873 51	400 00
Scorton harbor, . .	Jetty and dredging, .	15,000 00	12,916 65	-
Sesuit harbor, . .	Jetty, . .	10,200 00	10,240 20	-
Shirley Gut, . .	Dredging, . .	-	1,906 20	-
South River, Salem, .	Dredging, . .	5,000 00 ³	8,097 67	-
Southerly shore of South Boston.	Dredging, . .	100,000 00	100,239 96	-
Stage harbor, Chatham, .	Dikes, . .	6,000 00	9,231 93	-
Stony Beach, Hull, . .	Sea wall, . .	11,500 00	11,227 17	-
Taunton River, Boston harbor canal.	Survey, . .	10,000 00	9,932 75	-
Vineyard Haven harbor, .	Stone breakwater, .	30,500 00	28,796 58	430 00
Waquoit Bay, . .	Survey, . .	1,000 00	701 61	-
West Bay, Osterville, .	Jetties and dredging,	33,500 00	39,507 02	-
West Falmouth harbor, .	Dredging, . .	25,500 00	15,606 66	9,000 00
Weymouth Fore River, .	Dredging, . .	37,500 00	14,065 04	-
Wild harbor, . .	Breakwater, . .	5,150 00	93 13	-
Winthrop harbor channel,	Dredging, . .	5,000 00	9,203 37	-

¹ \$2,500 additional by town of Manchester.² One-half cost by town of Plymouth.³ \$3,000 additional by individuals.

Small Harbors, etc. — Concluded.

LOCALITY.	Character of Work.	Total Appropriation.	Total Expenditure.	Approximate Balance required to complete Contract.
Winthrop harbor, Cottage Park.	Dredging, . . .	\$6,525 00	\$6,581 66	-
Witchmere harbor, . . .	Jetties and dredging,	16,588 04 ²	22,622 02	-
Wollaston beach, Quincy, .	Dredging, . . .	15,000 00	14,644 61	-
Wrecks,	Removal from tide water.	6,416 66	6,258 78	-
Totals, . . . . .	. . . . .	\$1,295,746 89	\$1,135,729 81	\$106,590 00

Boston Main Harbor. — From 1870 to 1909 inclusive.

Anchorage basin, . . .	Dredging, . . .	\$1,002,500 00	\$504,268 50	-
Boston harbor, . . .	Dredging, . . .	165,000 00 ³	515,353 05	-
Commonwealth flats at East Boston.	Harbor improvement,	100,000 00	35,084 27	-
Commonwealth's flats at South Boston.	Harbor improvement,	3,838,902 03	3,099,879 82	\$64,500 00
Commonwealth pier, . .	Wharf and slip, . .	400,000 00	381,877 09	-
Dry dock,	Investigation, . . .	5,000 00	435 50	-
Metropolitan dock system,	Investigation, . . .	1,000 00	644 15	-
Northern Avenue, . . .	Bridge,	260,000 00	260,000 00	-
South Bay improvement fund.	Dredging,	59,487 50	57,341 24	-
Totals, . . . . .	. . . . .	\$5,831,839 53	\$4,854,883 62	\$64,500 00

Connecticut River. — From 1888 to 1909 inclusive.

Agawam,	Bank protection, . .	\$13,000 00	\$11,430 19	-
Hadley,	Bank protection, . .	68,000 00	70,816 72	-
Hatfield,	Dikes,	7,500 00	6,700 75	-
Holyoke,	Dredging,	15,000 00	-	-
Investigation of navigation,	- - - - -	5,500 00	2,788 01	-
Northampton,	Bank protection, . .	1,500 00	1,524 20	-
West Springfield, . . .	Bank protection, . .	5,000 00	5,051 49	-
Totals, . . . . .	. . . . .	\$115,500 00	\$98,311 36	-

Summary.

Small harbors, 1893 to 1909,	- - - - -	\$1,295,746 89	\$1,135,729 81	\$106,590 00
Boston main harbor, 1870 to 1909.	- - - - -	5,831,839 53	4,854,883 62	64,500 00
Connecticut River, 1888 to 1909,	- - - - -	115,500 00	98,311 36	-
Totals, . . . . .	. . . . .	\$7,243,086 42	\$6,088,924 79	\$171,090 00

¹ \$500 additional by town of Harwich.² \$3.64 from small items.³ \$352,349.55 in addition from income of harbor compensation fund.

APPENDIX B.

[See page 4 of this report, *ante*.]

CONTRACTS MADE AND PENDING DURING THE YEAR 1909.

Contract No.	Work.	Contractors.	Date.	To be completed.	Condition of Work.	Prices.	Amount.
17	Anchorage basin, section 1, .	New England & Eastern Dredging Cos.	June 26, 1902,	July 1, 1904,	Completed,	Material dumped at sea, 16.3 cents, scow measure. Material dumped at South Boston, 19.3 cents, scow measure. Material relanded, 18.3 cents in fill.	\$202,000 00
18	Anchorage basin, section 2, .	G. H. Breymann, & Bros., assigned to Morris & Cummings Dredging Co.	June 26, 1902,	Apr. 1, 1905,	Completed,	15 cents per cubic yard, scow measure.	109,737 45
65	Breakwater, Revere, .	Rockport & Pigeon Hill Granite Cos.	Feb. 18, 1907,	Sept. 1, 1909,	Completed,	\$1.13 per ton,	54,378 41
72	Excavating Rock harbor, .	John H. Gerrish, .	Aug. 5, 1907,	June 1, 1908,	Completed,	\$5,000,	5,000 00
73	Riprap, river bank, Hadley, .	Daniel O'Connell's Sons, .	Aug. 9, 1907,	Dec. 1, 1907,	Completed,	\$1.60 per ton,	7,538 99
77	Widening West Bay cut, Osterville.	John H. Gerrish, . . .	Sept. 6, 1907,	June 1, 1908,	Completed,	Dredging, \$6,700. Removing old timber jetty, \$250. Moving stone, 50 cents per ton. Jetty stone furnished, \$1.90 per ton. Riprap stone furnished, \$1.50 per ton.	9,136 25
78	Building boat harbor, Deacon's Pond, Falmouth.	John R. Burke,	Feb. 24, 1908,	Oct. 1, 1908,	Completed,	Stone in jetties, \$2.05 per ton. Stone in riprap, \$1.80 per ton. Dredging, 22.7 cents per cubic yard.	31,518 53
82	Dredging between Savin Hill and Commercial Point.	J. P. O'Riordan,	May 18, 1908,	May 28, 1909,	Completed,	16½ cents per cubic yard, scow measure.	24,111 78
84	Dike at Herring River, Wellfleet.	Thomas & Connor, . . .	Apr. 24, 1908,	Aug. 1, 1908,	In progress,	\$16,250,	16,250 00
87	Dredging East Bay, Osterville.	Cavanagh Bros.,	July 17, 1908,	Dec. 1, 1908,	Completed,	\$7,000	7,000 00
89	Wharf, Penikese Island, .	Cahill Construction Co., .	Aug. 3, 1908,	Nov. 1, 1908,	Completed,	\$4,490	4,547 27

91	Dredging at West Falmouth,	John H. Gerrish,	Aug. 14, 1908,	Dec. 31, 1908,	In progress,	38 cents per cubic yard, scow measure.	8,750 00
92	Dredging in Plymouth harbor.	Eastern Dredging Co.,	Sept. 4, 1908,	Oct. 1, 1910,	In progress,	Dredging, 16.7 cents per cubic yard, scow measure; dolphins, \$120 each.	117,860 00
95	Stone jetty, Sesuit harbor,	William Sears,	Oct. 26, 1908,	Sept. 1, 1909,	Completed,	\$1.90 per ton,	8,976 55
96	Dredging South River, Salem,	Eastern Dredging Co.,	Dec. 14, 1908,	Apr. 15, 1909,	Completed,	38.5 cents per cubic yard, scow measure.	7,431 97
97	Riprap, Witchmere harbor, Harwichport.	Thomas & Connor,	Dec. 14, 1908,	July 1, 1909,	Completed,	\$2.15 per ton,	2,668 15
98	Riprap, East Bay, Osterville,	Connolly Bros.,	Dec. 16, 1908,	July 1, 1909,	Completed,	\$2.40 per ton,	1,680 00
99	Dredging Boston harbor, opposite India wharf.	Eastern Dredging Co.,	Apr. 5, 1909,	May 3, 1909,	Completed,	28 cents per cubic yard, scow measure.	4,746 84
100	Enlarging channel, Wollaston beach, Quincy.	Bay State Dredging Co.,	Apr. 23, 1909,	June 1, 1909,	Completed,	37½ cents per cubic yard, scow measure.	7,046 21
101	Dredging channel, Orient Heights.	J. P. O'Riorden,	July 14, 1909,	Dec. 31, 1909,	In progress,	24½ cents per cubic yard, scow measure.	8,000 00
102	Riprap, Bass River, Yarmouth.	Connolly Bros.,	July 14, 1909,	Dec. 1, 1909,	In progress,	\$2.30 per ton,	9,200 00
103	Riprap at Chatham,	Wm. Sears, D. A. Eldridge & Charles H. Taylor.	Aug. 6, 1909,	Oct. 1, 1909,	In progress,	Quarry grout, \$2.60 per ton; clumps or field stone, \$2.60 per ton.	12,225 72
104	Stone jetty and breakwater, Vineyard Haven harbor.	E. S. Belden & Sons,	Aug. 6, 1909,	Nov. 1, 1909,	In progress,	Stone in breakwater, \$1.23 per ton. Clamps, \$5 each. Stone in jetty, \$1.53 per ton.	9,440 00
105	Sea wall, North Scituate beach.	Rendle & Stoddard,	Sept. 8, 1909,	Oct. 31, 1909,	Completed,	\$5 per lineal foot,	1,400 00
106	Dredging channel and anchorage basin, West Falmouth.	John H. Gerrish,	July 2, 1909,	June 1, 1910,	In progress,	Entrance channel, 38 cents per cubic yard. Anchorage basin, 30 cents per cubic yard.	9,000 00
107	Dredging Annisquam River, Gloucester.	J. P. O'Riorden,	Sept. 8, 1909,	Dec. 31, 1909,	Completed,	Shoal No. 4, 20 cents per cubic yard, scow measure. Balance of work, 22½ cents per cubic yard, scow measure.	9,004 59
108	Dredging Reserved Channel, South Boston.	Bay State Dredging Co.,	Oct. 8, 1909,	Nov. 1, 1909,	Completed,	21½ cents per cubic yard, measured in scows.	3,160 73
109	Oak pile wharf on Reserved Channel, South Boston flats.	L. Robert Tidd Co.,	Oct. 8, 1909,	Jan. 31, 1910,	In progress,	\$10,101,	10,101 00
110	Dredging at Commonwealth pier, South Boston.	Eastern Dredging Co.,	Oct. 22, 1909,	May 31, 1911,	In progress,	15.3 cents per cubic yard, measured in scows.	53,550 00
112	Extending stone jetties at Herring River.	William Sears & David A. Eldridge.	Nov. 26, 1909,	Sept. 1, 1910,	-	\$2.60 per ton,	9,000 00

INDEX.

INDEX.

COMMISSIONERS' REPORT.

	PAGE
Anchorage,	5
Angle Tree Monument,	11
Annisquam River,	12
Appropriation for Survey and Improvement of Harbors,	60
Back Bay Lands,	11
Bass River, Yarmouth,	13
Boston Harbor,	4
Buck's Creek, Chatham,	15
Cape Cod Canal,	17
Charles River,	5
Chatham,	19
Commonwealth Flats at East Boston,	7
Commonwealth Pier,	9
Commonwealth's Flats Improvement Fund,	61
Commonwealth's Land and Flats at South Boston,	8
Connecticut River,	20
Cotuit Harbor,	21
Cuttyhunk Harbor,	22
Deacon's Pond, Falmouth,	23
Dorchester, dredging Easterly Shore of,	23
East Bay, Osterville,	25
East Boston,	11
Green Harbor,	26
Harbor Compensation Fund,	61
Harbor View,	6
Hearings, Inspections, etc.,	3
Herring River, Harwich,	26
Herring River Dike, Wellfleet,	27
Hingham Harbor,	28
Humarock Beach, Scituate,	29
Licenses granted during the Year,	47
Lobster Cove,	12
Lynn Harbor,	30
Massachusetts Atlas Sheets and Town Boundary Atlases,	46
Menamsha Inlet,	31
Miscellaneous Permits granted during the Year,	52
Northern Avenue and Bridge,	9
Orient Heights,	7
Penikese Island,	31
Plymouth Harbor,	33
Province Lands,	33
Revere Breakwater,	35
Rock Harbor,	35

	PAGE
Scituate,	36
Sesuit Harbor,	38
South River, Salem,	38
Town Boundary Survey,	39
United States, Work of, in Rivers and Harbors of the Commonwealth, .	56
Statement of Lieut.-Col. Edward Burr, Corps of Engineers, U. S. A., .	56
Statement of Lieut.-Col J. C. Sanford, Corps of Engineers, U. S. A., .	58
Vineyard Haven Harbor,	40
West Bay, Osterville,	41
West Falmouth Harbor,	42
Weymouth Fore River,	43
Witchmere Harbor,	44
Wollaston Beach, Quincy,	45
Wrecks and Obstructions,	46

APPENDIX.

Appropriations and Expenditures, 1893-1909,	65
Contracts made and pending during the Year 1909,	68



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